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THE
GEOGRAPHICAL REVIEW

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A PILGRIMAGE IN NORTHEASTERN AFRICA, WITH STUDIES OF DESERT CONDITIONS

By WILLIAM HERBERT HOBBS

It is a significant fact that the men who have profoundly modified the foundations of natural science, those whose writings mark on the long journey the important stations at each of which new outlooks have been afforded, have with few exceptions traveled to distant regions where nature could be studied in her widely varied aspects. Alexander von Humboldt and Leopold von Buch, Wallace and Darwin and Huxley, Lyell and Dana: these are names that come at once to mind. For the most part these great scientists antedated the modern period of intense specialization, with ever greater narrowing of the field of study; but there is no reason to doubt that for the broader systematic phases of natural science, and for the earth sciences in particular, conditions have not greatly changed in this regard. The geographer or the geologist who would correctly interpret the earth's past records must have himself observed nature in different latitudes and under different conditions of climate.

In so far as their means permit them to do so, American students of geology and geography, in common with their non-scientific compatriots, are believed to avail themselves of opportunities for travel; though probably less than formerly, when the lack of well-equipped graduate departments in America led them to pursue their studies at European and especially German universities. The large expense entailed by extended travel, and its opportunities for general culture, will usually counsel an itinerary so planned as to combine professional with cultural studies. Without access to the necessary literature, which is often scattered and not readily accessible, such an itinerary may not be easy to lay out; and a real need exists for collated information concerning scientific pilgrimages of this nature.

Our universities being so generally surrounded by country which is well watered, there is a special need that students of geology and geography

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should as early as possible become familiar with the widely different aspects which are presented by the arid regions. Of deserts easily accessible from Europe, Egypt and the Sudan have perhaps the most to offer, while affording in addition the opportunity to study the most ancient and wonderful of human monuments. It is therefore proposed here to outline a geological pilgrimage in this region, where the conditions of humid and arid climate meet with more sharply defined contacts than elsewhere upon our planet.

The many possible routes to Egypt from Europe represent varying degrees of comfort and interest, the quickest being that from Brindisi in southeastern Italy. This route, like those from Naples, permits the student to make interesting excursions into the famous volcanic districts of the Italian peninsula. The route to Egypt via Constantinople and the Piræus (Athens) offers in normal times such allurements in the opportunities for observing Oriental life and customs and for traversing the theater of action of great modern wars as perhaps to compensate for the somewhat greater expense. The return from Egypt may be made to advantage by a different route, the cheapest and not the least interesting being by so-called "intermediate" steamer of one of the British lines from India with ports of call at Port Said and Malta. The chief disadvantage of such a passage is that the boats seldom sail on scheduled dates, and one must be prepared for some delay. Malta, which is of itself exceptionally interesting and offers access by steamer to Tunis with its hinterland of desert, has a daily service by small steamer with Syracuse in Sicily, the trip being made in eight hours.[1]

The approach to Alexandria from the sea affords one of the most remarkable of physiographic contrasts. Out of the low green plain of the fertile delta rises the slim column of the Damietta light, and, as we approach nearer, the minarets of the mosques and the tall chimneys of factories come into view: but this picture of fruitful soil and of human occupation is joined in sharpest contrast with the barren yellow *hamada* of the Libyan Desert, which stretches away westward into the distance. With slightly varying aspects this contact of desert and fertile land is one which the traveler will have ever before him in Egypt, until by its very repetition he ceases to be surprised at it and comes to understand why the Nile is in Arabic *bahr*, "the river." Its waters alone give life, and, were the groaning irrigating devices, the *shâdûf* and *sâkyeh*, to cease working, the strips of land along the banks would soon revert to desert.

While in Cairo the student will not fail to visit the Museum of Geology on the Sharia Sheikh Rihan, where he will find in frames general and special geological maps of Egypt and in cases a collection of the characteristic rocks and fossils of the country. The type specimens of the gigantic tortoise *Testudo Ammonis* and the Oligocene rhinoceros *Arsinoï-*

[1] Steamship lines are likely to be profoundly modified as a result of the world war.

therium are to be found here and, further, an excellent collection to illustrate the processes of desert weathering and erosion. Across the Nile

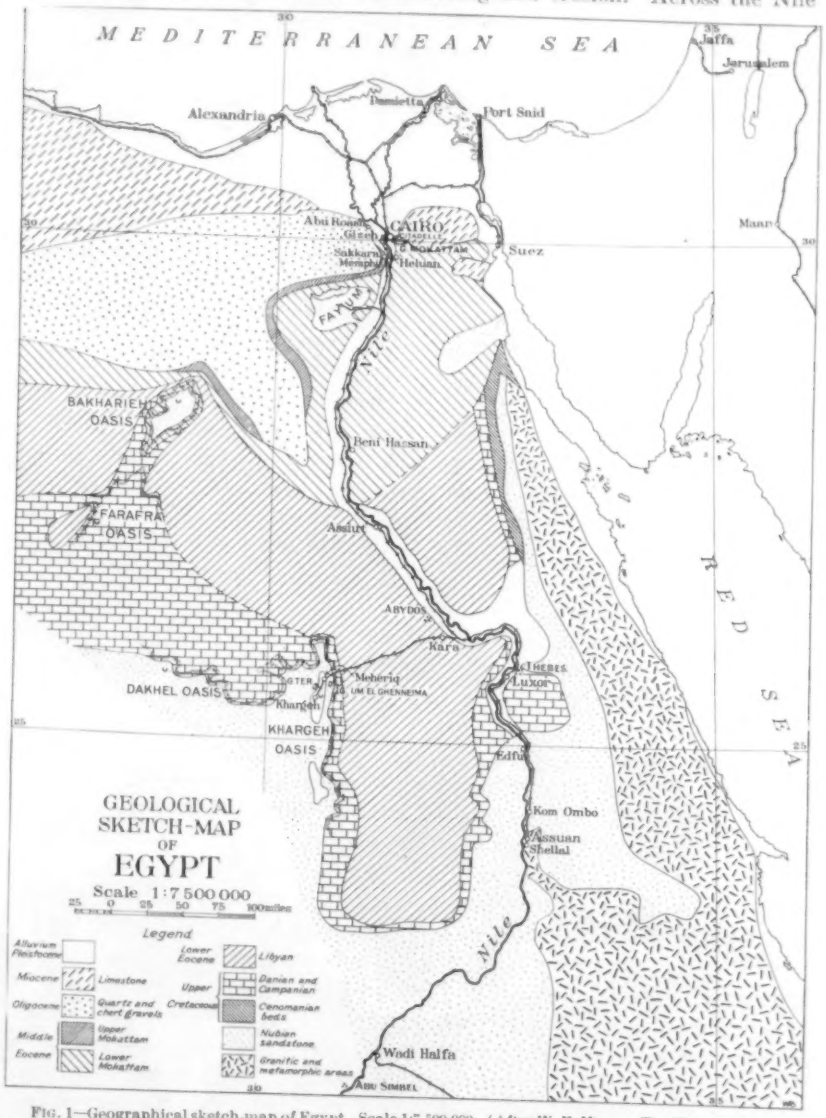

FIG. 1—Geographical sketch-map of Egypt. Scale 1:7,500,000. (After W. F. Hume: The Effects of Secular Oscillation in Egypt during the Cretaceous and Eocene Periods, *Quart. Journ. Geol. Soc. London*, Vol. 67, 1911, pp. 118-148.) The geological symbolism does not extend east of the Suez Canal.

in Gizeh are the attractive Zoölogical Gardens, with representatives of African animals, birds, and trees, the latter unfortunately seldom labeled.

so that one may really learn more of the Egyptian flora by a visit to the Ezbekiyeh, or public park, in the heart of Cairo.

A first bowing acquaintance with the Eastern, or Arabian, Desert may be made from Cairo, going by tram to the foot of the Citadelle and thence either on foot or by donkey past the Mosque of Mohammed Ali to the summit of the Mokattam Hill. This mesa-like hill is of nummulitic Eocene limestone and has supplied the name to the great limestone formation of Egypt which extends on both banks of the Nile to and beyond Luxor, to be there replaced by the Nubian sandstone of Cretaceous age (Fig. 1). During the Pliocene or late Tertiary time the valley of the Nile was a fiord-like arm of the sea, as is shown by the *Clypeaster*-bearing deposits which are exposed near the west wall not far from Abadîyeh. The evidence of the subsequent elevation and its measure is indicated by the former shore-line on the Mokattam Hill, now at an elevation of about 200 feet above tide.

In visiting the Mokattam Hill one may continue his journey to the small petrified forest, where fragments of fossil wood, due to a silicification in Oligocene times, may be collected; but if possible the trip should be so timed as to view the sunset from the summit of Mokattam. Particularly after a strong wind, when the lower atmospheric layers are charged with the fine dust of the desert, the many hues of yellow and orange and red form a background to the range of pyramids which is not easily forgotten.

The great pyramids of Gizeh and the desert west and north of them as far as Abu Roâsh will repay at least two days of study, since here are opportunities rarely equaled to note the various phases of the desert weathering processes and sand polishing and to make observations stratigraphic and tectonic about the local uplift which in post-Mokattam time brought the faulted Cretaceous series into view in the core of the dome.[2]

Before outlining other excursions in Egypt it may be well to point out that the student who is a good walker and used to finding his own way with map and compass can well dispense with donkeys, donkey boys, and dragomans except on such longer excursions as are best made by camels. The Arab donkey boy in particular is found to have such limited knowledge of desert routes and such fear of undertaking a new one that he becomes a positive nuisance; and his patient little beast, unless cruelly beaten, is hardly able to make better time than the traveler afoot. Moreover, in the winter season the cool wind almost constantly blowing over the desert makes walking far from exhausting, though helmet and sun spectacles are necessary to shield one from the sun's rays. In this season, when alone the journey should be made, the heavy bottle of drinking water usually provided with luncheons may be dispensed with, for the

[2] H. J. L. Beadnell: The Cretaceous Region of Abu Roâsh near the Pyramids of Giza. *Geol. Surv. of Egypt Rept. for 1900*, Part II, Cairo, 1902.

fresh oranges or mandarins, which for a few piasters the traveler may purchase in sufficient number from the street vendors, will remove any sensation of thirst.

The necessary maps for excursions in Egypt can for the most part be obtained at the office of the Museum of Geology, Cairo, or at Diemer's book store in the Sharia Kamel, the valuable special maps by Schweinfurth and the geographic works treating of Egypt being obtainable at the latter place only. The topographic map sheets are published on two scales, namely, 1:50,000 and 1:10,000; and after laying out one's itinerary the necessary sheets should be procured at the museum office. They are, however, expensive and in most cases not indispensable. What the student cannot afford to do without is Professor Johannes Walther's "Das Gesetz der Wüstenbildung."[3] Not only is Professor Walther the "desert geologist" *par excellence*, and the new edition of his book the best treatment of what might be called the technique of travel of the geologist in arid lands, but its special adaptability to Egypt and the Anglo-Egyptian Sudan is shown by the fact that a majority of the localities cited for illustration and fully one-half of the 150 half-tone views which embellish the work are from photographs taken either in Egypt or in the Sudan.

Before leaving Cairo as a base, an excursion should be made to Heluan (35 minutes by train) and thence to the Walthertal, the Wadi Hof and neighboring Reilschlucht, and, if time permits, to the Wadi Gerraui and its ancient dam, in order to observe weathering effects in the hewn blocks.[4] In case the latter be omitted, the trip can be accomplished in one day, and it affords the opportunity to observe cliffs undercut through surface concentration and expansion of salts within the rock, combined with etching of the blown sand; likewise mushroom rocks, wadi location along fractures, the "blind" ends of wadis, etc. For this excursion Sheet II of the Schweinfurth series of maps[5] is indispensable unless one has Walther's book, in which a part is reproduced, since the newer government maps have abandoned the system of local names given by Professor Schweinfurth.

An excursion should also be made from the Great Pyramids of Gizeh upon the west bank of the Nile along the margin of the desert southward to Sakkâra and Memphis, the traveler returning to Cairo by evening train from the station of Bedrashein. The route will begin at the Mena House, where, if desired, donkey or camel can be procured. Here, as elsewhere in Egypt, it is best to bargain directly with a cameleer of the more responsible type, in order to avoid the commission which is secretly exacted by the hotel and is often as much as thirty to fifty per cent of the price. In passing the Great Pyramids the remarkable effects of weathering are to be noted low down within the range of action of the wind-blown sand, which

[3] Das Gesetz der Wüstenbildung in Gegenwart und Vorzeit, 2nd edit., Quelle & Meyer, Leipzig, 1912.

[4] Cf. Walther, *op. cit.*, pp. 23, 34, 117, 199, whence nomenclature.

[5] Aufnahmen in der östlichen Wüste von Aegypten, in 10 sheets, 1:200,000 (except Sheet I, 1:30,000), Reimer, Berlin, 1897-1910.

FIG. 2.

FIG. 3.

FIG. 2—The high flood plain of the Nile at Luxor, its surface about 22 feet above low-water level. View through gateway overhung with *Bougainvillea*, looking westward to the terrace on the further shore and to the Libyan *hamada* faintly outlined beyond. Berber boatman in felluca half hidden in the foreground.

FIG. 3—Mosque in the main square of the village of Khargeh.

FIG. 4—Mule tram as means of conveyance on railway, Khargeh oasis.

FIG. 5—A Bedouin encampment in the Khargeh depression.

has here evidently been carried upward at various times in the past as a result of dune accumulations about the base. The effects are most noteworthy on the south and west of the middle, or Khefren, pyramid.[6] The Sphinx brings into contrast the upper and lower divisions of the Mokattam limestone and exhibits well the manner in which softer layers yield to the attack of the blown sand.

Continuing along the desert margin we stop to observe the numerous flints, which here form an armor to the surface as a result of the lifting and removal of all finer materials by the wind—deflation. The residual flints remain entire in but few instances. Nearly all are split or sprung as a result of the temperature changes, which here have a wide range. The main result, we are inclined to believe, should be charged to diffission, or splitting when the stone, highly heated in the sun, is splashed by the cold dash of a desert downpour.

Arriving at the necropolis of Sakkâra the student of science will be amazed in contemplating the beautiful mural decorations in the *mastabas* of Ti and Ptahhotep, which prove beyond question that the Nile Valley, in the ancient days when Memphis flourished, abounded in large and small game—lion, antelope, oryx, ibex, gazelle—such as is found today in that paradise of sportsmen far to the southward in the region of abundant rains. With these African types there is occasionally seen the stag, a northern animal, and there are flocks of birds in great numbers. While the figures placed beside these animals and birds to indicate their numbers are without doubt gross exaggerations (in one instance 121,200), the former abundance of wild animal life in the Nile Valley must be admitted, since hunting scenes occupy so large a place in the reliefs.

By those who do not admit that important changes of climate have occurred within historic time, the disappearance of the game fauna from the Nile Valley is ascribed either to a disease epidemic, such as the recent rinderpest in South Africa, or to unrestricted hunting, such as caused the practical extinction of the American bison. This is hardly the place to marshal the evidence that great desiccation has actually occurred in the eastern Sahara within historic time, but rather to call attention to the necessity of a critical stage in the process of desiccation at which animal and vegetable life quite suddenly disappear. Such a crisis arrived in the Transvaal in 1913, and this has been vividly described by a lawyer with keen powers of observation who resided at Rietfontein in the heart of the district.[7]

But it is the cities of the dead and not of the living which are in Egypt left for our inspection. Upon the site of ancient Memphis, where as nowhere else in the world geology and so-called recorded history come

[6] Cf. Walther, *op. cit.*, pp. 111-115.

[7] Eugène N. Marais: Notes on Some Effects of Extreme Drought in Waterberg, South Africa, *Ann. Rept. Smithsonian Inst., for 1914*, pp. 511-522 (reprinted from *Agric. Journ. of Union of So. Africa*, Feb. 1914.)

into closest contact, we look down upon a chaos of ruined adobe walls. So strong was the belief of the ancient Egyptian in the immortality of his *ka*, or soul, and in the brevity of his life this side of the grave that it was only for the future life of his spirit that he builded enduring monuments.

FIG. 6—The beautiful temple of Hibis, north of the village of Khargeh, in process of restoration: the only building in Egypt which dates from the Persian dynasty.

It is none the less impressive to look down upon piles of débris which include the materials of a city of living inhabitants built at least 5,300 years ago and we know not how much earlier.

It is in Cairo that the traveler will complete his plans for any longer journeys up the Nile or out into the desert. The usual Nile tourist becomes

in most cases a hard-worked trailer in one of the conducted parties either of Cook or of the Hamburg Anglo-American Company, and during a period of three weeks or more he is hurried into caves of rock, where in numbers too large to permit of individual study of the monuments he is forced to listen to unlearned dragomans who lecture in "pidgin English." If he has not by long preparation made himself a specialist in Egyptology, he is likely to retain a confused impression only of the relationships of the many early kings and queens and of the gods and goddesses whose effigies are represented in such bewildering numbers.

The geological or geographical pilgrim, and we venture to say many another, will wisely spare himself time and expense and add both to his knowledge and to his pleasure by keeping clear of the conducted parties and selecting only the more important monuments for his study. He may thus, if he will, include in his itinerary the finest examples of Egyptian monuments with a visit to Khargeh (Kharga) oasis in the Libyan Desert, the "Great Oasis" of the ancients, and continue his journey far up the Nile and across the deserts to Khartum, returning by the Red Sea route to Suez and Cairo, without greater expense in time and money than the conventional tourist must undergo in his Nile journey to the first cataract at Assuan.

A circular ticket to Khartum with return by way of Port Sudan and the Red Sea route should be purchased without the Cairo-Luxor coupon (for which liberal discount is allowed) and the journey begun by rail up the Nile, the traveler stopping at Beni-Hassan and Abydos while en route to Markaz esh-Sharikeh in Khargeh oasis.

No geologist or geographer can afford to miss the opportunity which this side journey to Khargeh affords for becoming familiar with desert conditions. Probably nowhere within easy reach of civilization may so many phases of desert scenery be viewed from a car window and by camel journeys which do not require a camping outfit. It was in the hope of finding minerals and of developing the agriculture of Khargeh that the rich "Corporation of Western Egypt" built this railroad 122 miles in length across the *hamada* from the Nile to the oasis. After two and a half millions of dollars had been spent in development, it was established beyond doubt that valuable minerals were wanting, and the exploitation of the agricultural possibilities developed such difficulties that the project ended in complete failure. Since the railroad has now been acquired by the Egyptian Government, it is likely that the scientist will long have the opportunity to utilize this field for desert studies, despite the disaster to the corporation. If dependence is had upon the trains, three days at least must be devoted to the oasis, where an excellent rest house with all necessary comforts has been established at the headquarters of the company in Markaz esh-Sharikeh, and where every courtesy is extended to travelers. Before visiting the oasis the traveler should carefully read, and if possible

take with him, Dr. John Ball's "Kharga Oasis,"[8] H. J. L. Beadnell's "An Egyptian Oasis,"[9] and Walther's above-cited "Das Gesetz der Wüstenbildung."[10] As an antidote against the too strong *penchant* of both Beadnell and Walther to minimize the evidences of recent climatic changes, the student is advised to read Ellsworth Huntington's "The Libyan Oasis of Kharga,"[11] with its convenient sketch maps reprinted from Beadnell. The general map from Ball's report is sold separately by the Survey Department of Egypt (Sheet D 4), but the railroad and newer developments are not entered upon it.

The best train from Cairo reaches Oasis Junction (Mowaslet el-Khargeh) in the early evening. As at most other stations along the Nile there are here no accommodations for travelers, and word must be sent in advance by telegraph to the station of Markaz esh-Sharikeh, so that a rail motor car may be in waiting at the station to take the traveler to Kara rest house at the base of the *hamada* escarpment which forms the dividing line between the desert and the fertile plain of the Nile. If sufficient notice is given, this motor car can be used to carry a party of three or four across the entire 122 miles of desert plateau to the oasis, and the journey is thus made in four (instead of six) hours, with the opportunity of stopping at interesting points to make photographs or examinations. This trip can also be made on any day of the week.

On leaving Kara the railroad at first skirts the edge of the alluvial plain of the Nile, then enters the mouth of the broad Wadi Samhûd with its steep rock walls and characteristic flat floor of flood-borne rock débris. As we ascend the walls approach, and one makes out in succession the several beds of the Upper Cretaceous and Lower Tertiary formations which compose the plateau. A bed filled with great melon-shaped flint concretions is easily identified and thus allows us to take note of the scores of small vertical faults at fairly regular intervals with displacements measuring in most cases a few feet only. Among them small flexures can also be made out.

As the line ascends in zigzags we note the wadi vegetation along the floor of the valley,[12] and as the level of each member of the rock series is reached in turn a new color tone characterizes the protective rinds of the desert stones. Once the plateau is reached the flat *hamada* surface stretches away to the westward for nearly a hundred miles with no elevations in sight that rise more than a few feet above the general level. This true mesa is capped by a dense limestone of Eocene age, which has been polished by sand driven by northerly winds until it glistens in the sun like burnished

[8] Kharga Oasis: Its Topography and Geology, Survey Dept. of Egypt, Cairo, 1900.

[9] An Egyptian Oasis: An Account of the Oasis of Kharga in the Libyan Desert, With Special Reference to Its History, Physical Geography, and Water Supply, John Murray, London, 1909.

[10] Note especially pp. 30-33, 54, 56, 79, 141, 151, 159, 161, 172, 185, 193, 208-209, 211, and 225.

[11] *Bull. Amer. Geogr. Soc.*, Vol. 42, 1910, pp. 641-661.

[12] For a study of this flora see D. T. MacDougal: The Deserts of Western Egypt, *Plant World*, Vol 16, 1913, pp. 291-303.

FIG. 7.

FIG. 8.

FIG 7—Mummies, with wrappings removed, lying exposed on desert surface. A dog mummy still in its wrappings may be seen between the two nearest bodies. Scene of vandalism perpetrated by mummy thieves near Ed Deir, Khargeh oasis.

FIG. 8—The unique Christian necropolis north of the village of Khargeh: two hundred tombs laid out in streets.

metal. Wherever locally the surface of the ground is broken into low knobs the effective drilling portion of the sand streams has not been able to surmount them but has glazed the intervening trenches to the height of perhaps a yard, leaving the projecting tops as rough and brown reefs elongated in the wind direction. The parallel bands which stretch westward in considerable numbers on either side of the railway mark the position of the ancient caravan trail across the *hamada*, the camels in caravans being accustomed to maintain fairly uniform intervals in their ranks and to follow with great fidelity the worn tracks of their predecessors.[13] The loose stones along the route are thus eventually kicked out of the trail, so that it becomes ever more distinctly marked.

Sometimes for many miles the route of the railway crosses areas within which the ground is strewn with ellipsoidal flint concretions, these flints generally averaging a foot or more in diameter, so that they present the appearance of a field of watermelons; they are in fact referred to by the Bedouins as *el botik* (melons).

Near the railway station at kilometer 100 are several isolated sickle-shaped dunes, or *barkhans*, composed of yellow sand, which are connected with others in a far-flung north-to-south train here intersected by the railway. From this part of the plateau mirages are generally visible at mid-day far away to the north, where the greatest expanse of the plain is to be viewed.

As one approaches the western rim of the plateau toward Khargeh oasis low flat-topped hillocks interrupt the surface; these have become undermined by the etching sand blast to form the canopy rocks so characteristic of deserts (Walther's *Baldachinfelsen*). Between them occur distinct basins with alkali deposits.

In the immediate vicinity of the western rim the scenery changes as though by magic and one looks out to the westward as far as the eye can reach over a deep pit excavated from the plateau. On the floor of the pit the eye makes out the dark flecks which indicate the position of oases (Fig. 4) and the yellow bands which represent areas of dune sand, while here and there rise on steep slopes the flat-topped outliers of the plateau. As the train begins to descend into the depression by the Refûf Pass there is seen to the north within the pass what from the distance appears not unlike a black lava stream, but which is in reality an elaborately terraced mass of calcareous tufa. This tufa marks the position where, in a former period characterized by a relatively humid climate, a stream of water poured off the plateau into the basin. Within the tufa are enclosed impressions of leaves, and among them those of the oak, which today is not to be found within Egyptian territory and requires for its growth a relatively humid climate.

[13] For a striking photograph of camel trails in the desert see Fig. 13, facing p. 487, of W. A. Cannon's article in *Bull. Amer. Geogr. Soc.* Vol. 45, 1913.—EDIT. NOTE.

FIG. 9.

FIG. 10.

FIG. 9—Adobe sleeping place of fellaheen constructed as a refuge from serpents. Theban plain.

FIG. 10—Mud cracks in Nile mud sufficiently wide and deep to admit a man's arm to the elbow. Abu Simbel near second Nile cataract.

FIG. 11.

FIG. 12.

FIG. 11—Inundated villages with date groves caused by recent elevation of barrage at Assuan. Spheroidal weathering of granite seen on further shore, Nile above Assuan.

FIG. 12—Old landing place at Shellal above Assuan dam showing peculiar spheroidal weathering of granite under desert conditions. Submerged Berber village indicated by the crowns of palm trees rising out of the Nile in the distance.

From the earliest times the oasis has been a place of exile, and today the train deposits its chain gangs of "undesirables" guarded by black Sudanese soldiers at the first oasis station of Meherîk. These "undesirables" are in many cases common criminals, and since they would be unable to escape from the depression unaided, they are not imprisoned and are often unfettered when at work. The village barber at Meherîk, with a record of seven murders, shaved his patrons while a Sudanese soldier stood near at hand armed with a rifle.

As applied to any one of the several basins within the Libyan *hamada*, the term oasis is clearly a misnomer, for far from being oases they are arid tracts that enclose small "islands" of waving palms that are the true oases. The water for these *ains* is brought to the surface in part by natural springs but more largely by means of true artesian wells. These *ains* constitute less than one per cent of the surface at the bottom of the Khargeh depression. The deeper water-bearing layer found at a depth of several hundred feet beneath the floor of the basin appears to have been tapped in the very earliest times by pipes which had been hollowed from acacia *(sont)* logs cleverly joined to one another. Such constructions betray a high degree of intelligence, and the various ruins would indicate that large and prosperous communities were established in the basin near the beginning of the Christian era. Today the people are idle and in intelligence much inferior to the fellaheen of the Nile Valley. Few of them have sufficient enterprise to journey to the neighboring villages. It is possibly because of this lack of enterprise, though probably more largely owing to the fact that the district has been shielded from tourists, that the idea of *bakshish* is almost unknown.

The principal village is Khargeh, which has a population of 4,500, and with 125 wells supports nearly 45,000 date and *dûm* palms, or nearly two-thirds the entire number growing in the basin. This village is built largely underground as a protection against enemies and resembles a great rabbit warren.[14] In a central square open to the sky there is a rather picturesque mosque (Fig. 3). As one threads his way through the narrow streets he catches glimpses of women untidy of person, but with great gold rings inserted through the nose and wearing necklaces of the same precious metal. Basking in spots reached by the sun are young children whose faces are so covered with flies as to appear like black patches except where the raw surface is exposed.

Like the palms, exotic products of the desert, alfalfa or lucerne is grown and in repeated crops, sometimes as many as twelve in the year; with, in addition, beans, barley, summer wheat, cotton, and sugar cane. Of denizens of the desert there are the acacia *(sont)* trees, tamarisks, and camel grass.

[14] Cf. the account of the underground dwellings of the Matmatas, a Berber tribe living in the Tunisian Sahara, and Figs. 8, 9, and 10 of J. Russell Smith: The Desert's Edge, *Bull. Amer. Geogr. Soc.* Vol. 47, 1915, pp. 813-831.—EDIT. NOTE.

Few areas realize the conditions of absolute aridity more perfectly than this basin of the desert, in which the moisture of the air is only about one-fourth of that in Cairo, and where the skin cracks and finger nails quickly become brittle. For a period of at least twelve years no rain has fallen in the inhabited portion of the depression. There is, none the less, abundant evidence that in earlier times the region was more favored by climate and supported a large population. Mention has already been made of the heavy deposits of calcareous tufa which extend for several kilometers downward from the head of the Wadi Refûf on the line of the railway, and that leaves of the oak are encased in these deposits. This can only indicate the course of a stream which fell over the brink of the plateau as a cataract. Somewhat similar deposits have been found at the edge of the plateau above the Nile Valley. Probably dating from the same humid period are extensive lake deposits deeply cut by wind erosion which occupy the valley bottom over considerable areas near Markaz esh-Sharikeh and Khargeh. Fragments of pottery and complete utensils which have been exhumed from these lacustrine beds would indicate that the body of water, which at one time reached the level of some 275 feet above the sea, continued well into the historic period, if not into Græco-Roman times.

In order to reach points in the basin along the line of the railway, the traveler may make use of a mule tram to carry his supplies while he makes excursions afield in various directions (Fig. 4).

The beautiful temple of Hibis is situated four kilometers north of the village of Khargeh and is the only building in Egypt dating from the Persian dynasty (521-338 B. C.). Built by Darius the Great and largely buried in sand, this temple has been recently exhumed and restored under the auspices of the Metropolitan Museum of New York, with the co-operation of other societies, aided by the active personal interest of the late Pierpont Morgan. Small though this temple is and half hidden in a grove of date palms, its beauty is such as to call forth the admiration of every lover of art (Fig. 6).

At the unique Christian necropolis, a city of some two hundred tombs laid out regularly in streets (Fig. 8), one gains as nowhere else in the region a conception of the importance, relatively to the present, of the former life of the region. Here as elsewhere in Egypt one is struck by the fact that though we have before us the cities of the dead bespeaking a people of wealth and power, we nowhere find more than a trace of their earthly habitations.

The necropolis gives but a partial idea of the extent of earlier habitations, though it undoubtedly indicates better than anything else the prosperous condition of the inhabitants. Today in Egypt and the Sudan the burial of a man of the people is made as simple as possible. The body is carried out of the village, deposited upon the ground, and a few handfuls

of sand are scooped over it. Thus exposed, the kites and other scavengers soon remove the fleshy portions, leaving the skeleton only. The country is one in which customs have persisted with little change throughout the ages, as perhaps nowhere else upon the globe, and inasmuch as the embalming process involves the use of expensive materials this mode of burial has been restricted to the more prosperous. None the less there are found in other portions of the Khargeh depression simple rock tombs, and in one instance these have been ravaged by mummy thieves in order to secure jewels and other trinkets left upon the bodies. With their wrappings removed the bodies were left scattered over the surface of the desert, presenting the appearance of a small battlefield (Fig. 7).

Aside from questions relating to human occupation, the depression of Khargeh supplies type illustrations of purely desert features, such as armored pebble pavements and canopy rocks, and in addition more unusual features which are dependent upon the nearly constant direction of the wind. Elongated ridges rising abruptly to windward and sloping gradually away to leeward have been carved out of the lake deposits near Markaz esh-Sharikeh. Few, if indeed any, regions offer such advantages for solution of the problem of origin of desert depressions, but the subject must be treated in another place. Before leaving the Khargeh oasis to return across the plateau to the Nile Valley the traveler should make one or more journeys by camel, the most interesting being perhaps that to the old fortress of Ed-Deir so as to pass on the way the butte of Gebel Um el Ghenneima. En route there is opportunity to study sickle-shaped dunes, or *barkhans*, the records of great desert cloudbursts of extremely local extent in deltas of torrential deposits, and, in the notch of the butte, remarkable examples of hoodoo-like spines cut out of limestone containing the hard shells of *Operculina Libyca*. Another trip should be made to the summit of Gebel Ter, where an excellent section of sedimentary formations with their enclosed fossils may be examined.

After returning to the Nile Valley the traveler may continue by rail to Luxor in the Theban plain, where are the remarkable tombs and temples, and from whence either by steamer or by rail the journey may be continued to the First Cataract, with stops at Edfu and Kôm Ombo. It is at Assuan, the ancient Syene, just below the cataract, that the granite first makes its appearance overlain by the Nubian sandstone. The great quarries at this place supplied the builders and sculptors of ancient Egypt, and their half-finished work remains for our inspection when we visit the quarries. Opposite Assuan is the granite island of Elephantine, with its interesting pot holes, which were made the subject of an important study by Professor Jean Brunhes.[15] The granite of this district, after extensive erosion, was overlain by the Nubian sandstone, and the channels within the granite which are followed by the river are marked out either as lines

[15] Le travail des eaux courantes, *Mém. Soc. Fribourgeoise des Sci. Nat.*, 1902, pp. 153-224.

of faulting or as zones of closely spaced dikes composed of more basic igneous rock, such as basalt.[16]

If the desert route to the Nile dam or barrage at Shellal be taken, one follows for a large part of the way the right bank of the cataract, with abundant opportunity to observe the blackened crust or rinds formed upon the surface of the granite within the range of the inundations. These rinds have been found to consist chiefly of manganese dioxide together with ferric oxide, lime, silica, magnesia, and traces of other substances.[17]

The effect of the latest addition to the barrage has been to raise the level of the water impounded above it by some five meters, submerging many villages whose position is indicated today by the crowns of date palms projecting above the water (Figs. 11 and 12). The characteristic weathering forms of the granite are spheroidal blocks regularly piled together. For days the half-submerged palm groves and these weathered masses give character to the landscapes viewed from the steamer en route to Wadi Halfa. At Abu Simbel, forty miles below Halfa, is the rock temple which is perhaps the finest of all the monuments of ancient Egypt. From Halfa the journey is continued by *train de luxe* across the sand desert to Khartum and thence eastward to the Red Sea at Port Sudan, the newly created harbor near Suakin. This portion of the journey is so well covered by Walther in his "Das Gesetz der Wüstenbildung"[18] that it is unnecessary to treat the subject here. The traveler returns from Port Sudan by way of the Red Sea to Suez and Cairo, thus completing a circular tour.

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[16] John Ball: A Description of the First or Aswan Cataract of the Nile, Survey Dept. of Egypt, Cairo, 1907.
[17] A. Lucas: The Blackened Rocks of the Nile Cataracts, Survey Dept. of Egypt, Cairo, 1905.
[18] Especially pp. 66, 72-75, 107-109, 153, 244, 285.

THE LAND OF THE MAQUIRITARES*

By LEO E. MILLER

Despite the great heat of the tropical lowland, the sight of the wine-red river hurrying silently past on some mysterious mission of its own was enough to chill the blood with an uncanny sense of dread and foreboding. Each foam-flecked wave, each racing whirlpool, the water itself, stained an ominous red, spelled treachery and a frenzied desire to engulf everything within its grasp. A wild mantle of low, gloomy jungle invested both banks far as the eye could see. Such was the Rio Atabapo when we saw it, a short distance above the point where it merges its terrifying character with that of the mighty Orinoco.

For the present, however, there was nothing to fear. The water tore at the granite battlement, against which our craft had been securely tied, with impotent fury. Above, forlorn and deserted, stood the fifty-odd adobe huts of San Fernando de Atabapo, almost the entire population having gone up-river to the scattered rubber camps, as this was the season for collecting the valuable latex. This last settlement in the Orinoco country was indeed a town in name only.

From the top of the granite eminence, the elevation of which is only 370 feet above sea-level, we could look across the broad sweep of the Atabapo and up the muddy Guaviare, coming from the southwest, which joins it on the side opposite the settlement. The mean temperature of the region is about 80° F., although in the sun the mercury ascends to 112° F. or more, but the town is not particularly unhealthful. There are few fish, no crocodiles or sandflies, and practically no mosquitoes, all of which is attributed to the discolored water. Two small springs near the town furnish an abundant supply of potable water, and, when during the rainy season these are covered with the overflow from the river, it is necessary to paddle across the Atabapo and fill the water jars from the Guaviare.

To secure a crew of men for our trip up the river was a difficult undertaking and required a great deal of time. This gave us an opportunity to explore the surrounding country.

In the immediate vicinity of San Fernando the forest has been cut down and tall second-growth sprouts form dense thickets; this is the favorite resort of many small birds, and several species of nighthawks make it a daytime rendezvous. The basic granite crops out in many places, the

* This is the second of two articles dealing with the author's zoölogical reconnaissance trip in 1912-13 up the Orinoco to the Mount Duida region in southern Venezuela. The first article, published in the April *Review*, pp. 258-277, carried the expedition as far as San Fernando de Atabapo. The present article takes up the narrative at that point. For location of places see the map in the first article.

ledges occasionally standing on end, and it is often streaked with narrow seams of quartz. There is no cultivation of any kind; the inhabitants lack all initiative for work and eat tinned foods and manioc received in exchange for trinkets from the Indians.

When we returned a few months later, a changed town confronted us. The rubber collectors had returned from their several months' isolation in the interior and were spending the fruits of their labor as rapidly as possible. Dance halls, gaming dens, and almost every conceivable device for relieving men of their money had sprung up like mushrooms, and there was drinking and merry-making day and night. Then suddenly and without presage a tragedy occurred; it will never be forgotten by the few who survived.

Governor Pulido, so it was rumored, had imposed a new tax on all rubber collected in the district and had come to San Fernando personally to collect the extortion. Naturally, there was a good deal of dissatisfaction, and one night, just after we had been provided with a canoe and secretly advised to leave as soon as possible, the storm broke. A band of men, said to be under the leadership of one Colonel Funes, an Indian and the most notorious man in the district, attacked the town, killed the governor and practically the entire male population, and rifled the shops and dwellings. If one may believe the tales of the few who escaped the brutalities committed that night, the deeds rival those of the most barbaric ages.

Perhaps some of those who perished deserved their fate; others assuredly did not; but it is a fact that government offices had been conducted abominably. In the post-office, for example, stamps were sold for twice their face value, and if one did not purchase them there and place them on the letters in full view of the postmaster, the mail was destroyed. The physician who chanced to be there, named La Page, and who apparently belonged to the military organization, as he wore the regulation uniform, tried to collect over four hundred dollars, gold, for a few injections of quinine; and so the robbery went on until the whole band was exterminated.

Having engaged a captain with some experience on the upper Orinoco and a crew, we on February 3 loaded the low river-boat and started on our mission, reaching a point called Puerto Ti Ti that night; from this spot a wide trail leads through the magnificent forest to the clearing wherein stands San Fernando.

For six days we made slow but steady progress up the river and then entered the formidable Raudal de Santa Barbara, a rapid which extends across the entire delta of the Ventuari.

The Orinoco here is wide and, with few exceptions, so shallow that we pushed ahead with long poles. Where the water was deep and the current swift, long-handled hooks were used to catch the overhanging vegetation and pull the boat along. This mode of travel was always slow and

FIG. 1—Looking up the Cunucununa a short distance above the Raudal del Muerto.

FIG. 2—Raudal del Muerto on the Cunucunuma: unloading the *piragua* preparatory for the portage.

dangerous, and the swarms of wasps and other insects living among the leaves, which were shaken down by this procedure, made far from agreeable traveling companions. The banks were covered with dense, virgin forest; but there were extensive sandbanks and flat ledges of rock at convenient intervals, and one of these was always chosen for a night's camping site. If we chanced to be on a *playa*, the early hours of the evening were spent in fishing. Armed with *machetes*, a bag, and acetylene lamps, we waded out in the shallow water and "shined" the shoals of fish much in the manner that frogs are caught in parts of this country. At night the fish swam near the surface, and by directing the rays of the strong white light upon them one could approach to within a short distance and then strike with the knife: in this manner large numbers were taken. Occasionally a large sting-ray, electric eel, or crocodile was suddenly encountered, and then there ensued a hurried scramble in the other direction; this gave the pastime a decided element of sport. We also became more familiar with the dreaded *carribe*, or cannibal fish, known as the *piranha* in Brazil, with which the water teemed. In the Orinoco they attain a weight exceeding three pounds and are formidable indeed. The natives will not go in bathing except in very shallow water, and I know of two instances where men were attacked and severely bitten before they could escape. The fish somewhat resembles a bass in shape, although the mouth is smaller; the jaws are armed with triangular, razor-edged teeth, and as these fish travel in immense shoals they are capable of easily devouring a man or large animal if they catch him in deep water. Floundering or splashing in the water attracts them, but they seldom attack unless their appetite has been whetted by a taste of blood, and then woe to the unfortunate creature that falls into their power. To catch them, we used a strong hook secured to a long wire leader and baited with any kind of raw meat, and they always put up a good fight. Without a wire, a line would be bitten in two every time a fish struck. When taken from the water they are first killed by a blow on the head with the *machete* and then removed from the hook.

At night there was always a heavy dew, and it rained intermittently each day. On dark nights, and often after a shower, the banks of the river, where there was forest, glowed with twinkling phosphorescence. Examination showed that the decaying vegetation was filled with myriads of small, wriggling insects, greatly resembling our well-known cellar-bug (isopod), and one day we paddled for many hours through a mass of flying ants which had come to grief in the river. The water was covered with them, and the waves had tossed them up on the banks to a depth of several inches. Another thing that attracted our attention was the large number of bats. On one occasion we heard a dull rumbling among the granite ledges near camp, and, not long after, a stream of bats began to emerge from the cracks; from a distance they resembled a cloud of smoke. There must have been many thousands, for the black masses continued to rise

until darkness obscured them from our view. Spruce[1] records that on one occasion he saw not less than a million under similar circumstances. This brings up an interesting problem; the individual range of these bats is probably not very great, the result of which is that immense numbers of them are distributed over a comparatively small area. Now, if the struggle for existence is as keen as it is often supposed, how can the female, encumbered with her offspring fully three-fourths as large as herself, compete successfully with the unhampered males and secure enough food not only for herself but also for her young? The fruit-eating varieties might not suffer seriously from this handicap, but it does seem as if the agility of the insectivorous kinds catching their food on the wing would be greatly affected.

There are numerous geological features along the river which cannot fail to attract the interest of the traveler, no matter what his particular mission may be. One of these is the Cerro Yapacana, a square block of granite not over 6,500 feet high, an outlier of the Guiana highlands, that mass of ancient rocks which extends across eastern Venezuela and the Guianas and along whose base the Orinoco describes its semi-circular course. It is a very conspicuous landmark, as it towers above the forest like a giant monolith and can be seen many miles away. We did not come abreast of it until eight days after first sighting it.

There are few rubber camps along this part of the river, but several Indian families had come to spend a number of weeks collecting turtles and eggs on the sandbanks. At night absolute quiet reigned on the *playas* so long as the moon shone; but no sooner had the brilliant orb disappeared below the horizon than the water was broken into ripples as numbers of turtles emerged to deposit their eggs in the loose, warm sand; and jaguars came from the dark forest to feast on the defenseless creatures and rend the still night air with ugly coughs and grunts.

In returning from fishing excursions we usually cut across the several miles of sandy waste toward camp, guided by the bright fire which the cook was required to keep burning, and in this way learned a good deal about the turtle's habits. After leaving the water, the creature makes its way toward the highest point on the island or *playa*, and with a few powerful strokes of the flippers excavates a deep hole; the eggs, twenty to a hundred in number, are then deposited, after which the sand is scooped back into place and patted down so carefully that it takes a very experienced eye to locate the spot. The turtle then hurries back to the water, where it apparently remains until the following year. When the eggs, warmed by the sun's rays, finally hatch, the *playas* swarm with small turtles, which are eagerly collected by the natives, cooked entire, and eaten. The egg contains a great deal of oil and, although boiled a long time,

[1] Notes of a Botanist on the Amazon and Andes . . . . . 1849-64, edit. by A. R. Wallace, London, 1908.

FIG. 3—Nesting tree of great orioles. Occasionally one tree will contain over one hundred nests.

FIG. 4—A wild bees' hive. Honey forms an important item on the food list of many South American Indians. (*Note:* The left of the picture should be the bottom.)

always remains soft. *Iguana* eggs are taken also and boiled and eaten even when about to hatch.

Besides the turtles there were many other signs of life on the sandbanks. Waterbirds, squatting low in some cup-shaped hollow, looked stupidly at the dazzling light of the gas lamps and could be approached to within a few feet; downy young birds waited quietly until nearly touched with the hand and then ran away into the darkness like puff-balls rolling before a breeze.

The Raudal de Santa Barbara is a wicked stretch of water. The Ventuari, coming from the neighborhood of the Brazilian border, forms an extensive delta at its mouth. There are many islands, some of great size, and all heavily forested. The Orinoco is very wide, and hundreds of sharp, tall rocks protrude above the water, causing a series of rapids which are hard to ascend. It took us three days of the most trying kind of work to traverse this stretch of agitated water and finally to haul the boat up the falls, which come as a sort of climax at the end. A strong wind blows from the north almost constantly, whipping the water into a choppy sea. On the bank stands a good-sized rubber camp, and extra hands can usually be secured to help pull the boat through the rapids. The men from this place had just returned from a hunt in the forest, bringing two jaguars and an armadillo weighing sixty-five pounds. One of the jaguars was black. All of these animals were eaten, and of the two species the flesh of the jaguars was the better. One night, not long after, one of these animals invaded our camp. As the sandbank we had selected was a narrow one, the crew chose to sleep on the forest side; they greatly feared the crocodiles in the river. Early in the morning I was awakened by a jaguar's roaring, mingled with frightened wails, and upon investigation discovered that the men had come to our part of the camp near the water, leaving the captain's wife in their former location. They had reasoned that she was the least useful member of the party and had compelled her to remain as "bait." Maria was sent back to San Fernando in the next canoe we met bound down the river.

The abundance of the big, spotted cats and their harmlessness under ordinary circumstances is astonishing, although at times they will attack human beings. At one of the rubber camps we were shown the skin of a recently killed animal which had stalked a two-year old child at play not far from the hut; the mother, a negress, seeing the animal in time, attacked it with a *machete* and killed it.

The next river of any importance to be encountered was the Rio Lao, reached on February 17. Up to this time the strong north wind had continued to blow without interruption, and the course of the river was strewn with islands. Rubber camps dot the river bank; and we had our first glimpses of the Maquiritare Indians. Owing to the frequent rains, the year had been a bad one for the *patrones,* or managers of the camps; also,

a kind of malady had broken out among the peons and Indians which killed many and frightened others away. Nevertheless, those who remained seemed quite contented, and, if we chanced to spend the night at a camp, or *barraca*, our men always joined them in their pastime of drinking, playing the guitar, and singing songs about one another far into the night. Some of the men were clever at improvising songs apropos of the occasion. At one place, for instance, they heard of the jaguar's visit to the sandbank and that the captain's wife had been sent back to San Fernando. Without hesitation, one of the peons sang:

Que tristeza en nuestro campamento!
Pobrecito Ildefonso está llorando.
A caramba, nadie está alegre!
Será porqué María fué á San Fernando.

The largest *barraca*, by far, which we saw was owned by an old Turk named Parraquete. He received us cordially, shook our hands, and embraced us, apologetically explaining that a slight fever prevented his rising from the hammock; later we found out that he was a leper in the last stages of the disease. He had fifteen Maquiritares in his employ, each of whom collected the latex from several hundred rubber trees every morning; in the afternoon the milk was smoked, one hundred pounds of the liquid yielding about forty or fifty pounds of crude rubber. A kind of heavy, deep red wood called *mazarandul* was used to produce the dense smoke necessary to coagulate the latex. *Hevea* only was gathered here, although *balata* was also collected farther down the river and on the Guaviare. The governor of the district told me that about fifteen million trees of the *balata* had been cut down along the latter river during the last ten years, as the method of securing this class of rubber necessitates the felling of the tree.

The proprietors of the rubber camps use the same system of keeping their helpers that the purchasers at Ciudad Bolivar employ; namely, they keep them constantly in debt by advancing large quantities of merchandise at exorbitant prices. It is not unusual for one *patrón* to sell some of his men to another for the amount of their debt, or more, if he can get it, and sometimes an unsatisfactory peon is turned loose in the wilderness to shift for himself. We picked up one such man who had been abandoned on a sandbank, in a half-starved condition.

Proceeding farther up the river, we passed the Cerro Cariche, another granite mass similar to Yapacana, but not quite so high. It stands on the south bank of the river, between the mouths of the two small streams called Cariche and Trocoapure.

Early on February 21 we had the first distinct view of the Cerro Duida, looming, faintly outlined, in the distance. From afar it resembled a high, level plain; but as the vapor clinging to the huge, dark mass slowly dissolved itself a well-defined, short range appeared, with twin peaks showing high above the rest of the mountain.

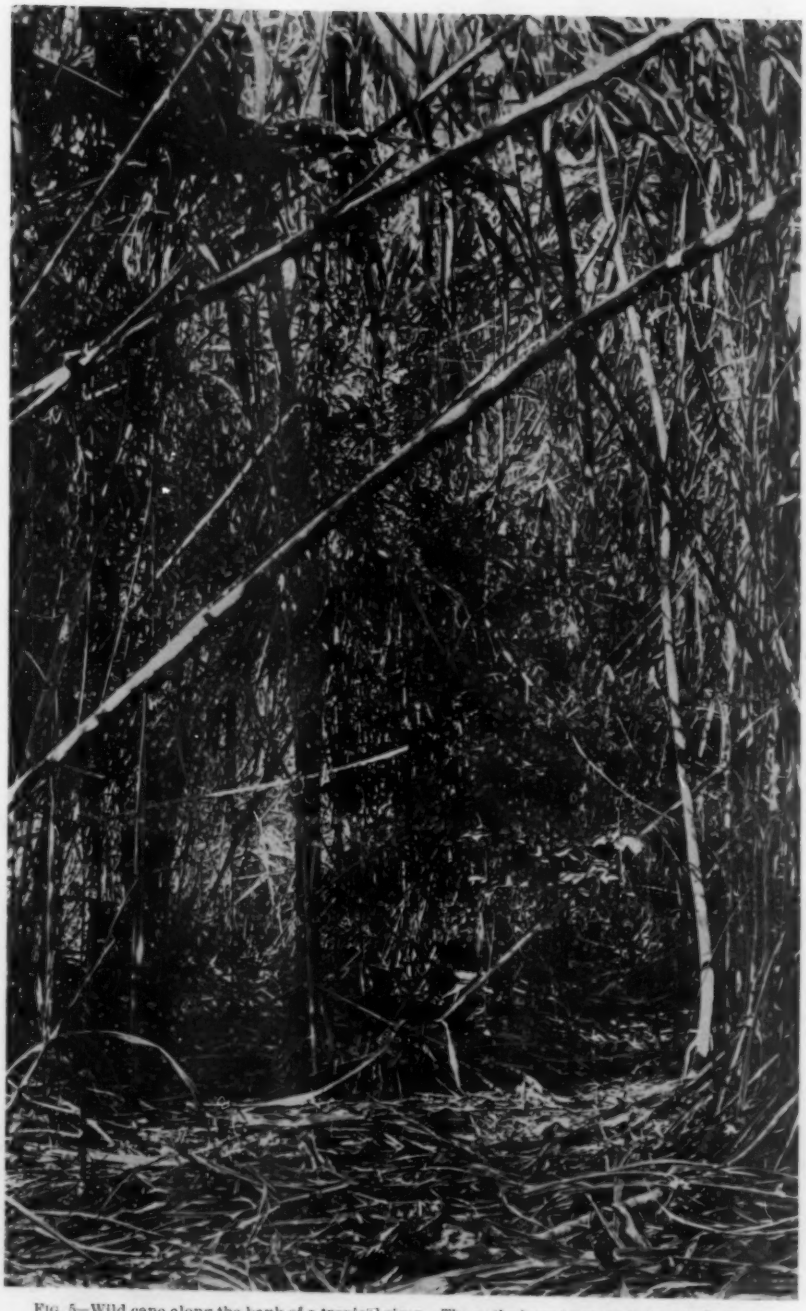

FIG. 5—Wild cane along the bank of a tropical river. The paths have been made by wild animals

The Orinoco steadily decreases in width, until the distance across is not more than half a mile; in many places the banks are high and composed of pink and white clay streaked with layers of dark blue. On both sides the jungle presents an unbroken wall of tangled verdure; occasionally a slender palm rears its delicate head high above the riotous mass as if gasping for one more breath of air before being strangled by the figs and creepers slowly entwining its stem with their death-dealing tentacles. Among the lower growth are vast areas of palms known as *coco del mono*, with long fronds resembling those of the *Seaforthia*, and bearing small, hard nuts; the leaves are used in thatching huts and the *caroso*, or covering, of the boats. Another palm, tall and thorny, resembles the well-known *chonta* of Colombia; it bears large clusters of red nuts which are very palatable when thoroughly boiled.

The heat was always intense and most oppressive; even the cool nights brought no respite, and in the early morning a thick vapor slowly rose from the water, to be later wafted above the tree-tops and disappear.

Flocks of *hoatzins*, or lizard-birds *(Opisthocomus cristatus)*, were seen almost daily. They fussed and fluttered among the dense vegetation but could not be induced to leave their dark retreat. There were also nesting trees of the black and yellow orioles, better known as *cassiques*, which are about the size of a bluejay; sometimes a single tree contained thirty or more nests placed close together; invariably there were also a number of large wasp nests in the same tree. The nests of these birds differed from those of the giant orioles *(Ostinops)* in being smaller and having the opening at the top instead of at the side of the swinging bag.

At the end of the twentieth day we reached the mouth of the Cunucunuma and camped upon its sandy banks for the night. This river is approximately 500 feet wide at its mouth, shallow, with dark, clear water, and flows southward, joining the Orinoco at right angles, as the course of the latter river at this point is westward: a low, forested hill called Ventana rises to the north. One may cover the distance from the mouth of the Cunucunuma to the Cassiquiare in a day, and reach the plains on which was located Esmeralda by continuing the journey an additional day.

Not far above the mouth of the river is the dry bed of a stream, said to have been the former course of the Cunucunuma; short, soft grass now covers the ancient, sandy route, and the lines of trees on each side present such clean-cut edges as to suggest well-kept hedge-rows. Tapirs and capybaras have worn many paths through the luxuriant sward; apparently these animals come out into the open at night to feed.

The current of the river is so strong that we could not average more than four or five miles a day. Through the clear water we could see shoals of fish and numbers of large sting-rays darting about over the bottom. One fish, resembling a beautifully spotted trout, rose eagerly to a trailing hook baited with a strip of white cloth; it weighs about a pound and is

called *pabón* by the natives; on two occasions members of this species leaped clear of the water and into the boat as we poled along after nightfall. Another kind greatly resembled a flying fish; leaving the water singly or in pairs, it skimmed over the surface for a distance of twenty yards or more, and then dropped with a splash; when "flying" it left a train of ripples in its wake, as if long appendages were trailing after it.

There now followed a series of low, disconnected mountains which might be called the foothills of Duida. The first of these is the Cerro Piapoco, 1,300 feet high; parts of it are covered with low, scrub growth, and the river winds around three sides of it. Next comes the Cerro Tapicure, a rounded granite mass approximately 1,400 feet high. At the base of the latter is a large Maquiritare plantation of yuca *(Manihot Aipi)*, pineapples, and plantains, on the edge of which stood the communal house, conical in shape and 100 feet in diameter. The place was temporarily deserted, as the Indians were down-river gathering the rubber harvest. Near by also grew a palm new to us, the *tamiche;* it is thirty feet high, with erect, undivided leaves, and the crown resembles a huge, green, opening tulip.

While tramping in the forest across the river from the Indian plantation we came suddenly upon a Maquiritare woman and her four little children, squatting around a small fire built under a rough lean-to. She was roasting a curassow and tearing off pieces for her young brood, who were devouring them with the voracity of wolves. The frightened glances of these wild people and their gnawing at the half-cooked flesh were quite in keeping with their surroundings and stamped them immediately as a perfect part of the virgin wilderness.

Rapids are not wanting in the Cunucunuma. The first is the Raudal del Muerto, formed by a wide ledge of rock which extends across the river and over which the water rushes with a deafening roar. Next comes the Raudal del Sina, which is longer but not so difficult to navigate. Just above this we entered the Sina, a small stream coming from the direction of Duida, and ascended to its highest navigable point; this, however, was only a few miles above its mouth.

The Cunucunuma, it may be stated, rises in the vicinity of the little-known Cerro Cauchamacari, and may be ascended to the foot of the Cerro Maravaca. On some maps its course has been traced on the eastern side of Duida, while in reality it is on the western side. Its tributaries from the east are the Tabarí, Sina, Cua, and Rio Negro; and from the west the Yacaré and Cumichi. There are numerous rapids. Besides the two mentioned, the Indians described the San Ramón, Rayado, Chácherito, Vaquiro, Mapaco, Chipirima, Picure, and Culebra, all of which must be passed before reaching the Maravaca.

The scenery along the Cunucunuma is the wildest imaginable and excelled in splendor anything I had heretofore seen. There nature, unre-

FIG. 6.

FIG. 7.

FIG. 6—Naturalist's camp in the forest. Red howler monkeys hanging from the line.

FIG. 7—Types of Maquiritare Indians and natives working in the rubber camp of Parraquete, an old Turk, on the upper Orinoco.

FIG. 8.

FIG. 9.

FIG. 8—Cerro Duida from the lower Cunucununa.
FIG. 9—San Fernando de Atabapo from the river bank.

stricted by the hand of man, attains its utmost development. Palms, ferns, lilies, and shrubbery are woven into an exquisite living tapestry by delicate creepers which, festooning each possible hand-hold, twine ever back and forth, up and down, in their tireless efforts to conquer their more vigorous rivals, and all unconsciously produce one of nature's loveliest masterpieces.

When rocks and low water barred further ascent we made camp on the high bank and began the arduous work of cutting a trail to Duida, about six miles distant. We had secured the services of a number of Maquiritares, two men, two women, and a boy, and these, together with the members of our crew, were immediately put to work on the trail. While this was in progress, we devoted ourselves to the exploration of the forest and its inhabitants.

Apparently the Indians, who, in common with many South American tribes, seek the smaller streams for their habitations, and who live in small groups all along the Cunucunuma, rarely visited this locality. Game was so abundant and so tame that it is certain that the animals had not been persecuted to any considerable extent. We also visited the house of the chief of the tribe, named Antonio Yaracuma, whose *cunuco* (clearing) was on the Cunucunuma, a few miles above the mouth of the Sina (Sina is a Maquiritare word meaning wolf). This place he chose to call Yacaré. Surrounding the great, conical house was a small patch of yucas and pine-apple plants, walled in on all sides by the interminable forest. The edge of the roof came down to within five feet of the ground, and there were eight fire-places, equal distances apart, showing that eight families occupied the dwelling. A perfect network of poles and beams supported the ragged grass and palm-leaf canopy, and, from these, various articles were suspended: drums, made of sections of hollow tree-trunks and covered with the skin of a red howler monkey on one side and of a peccary on the other; long tubular baskets of wicker-work, used to express the poisonous juice of the yuca root in making manioc; blowguns ten feet long, hammocks, and fishing tackle. Everything was immaculately clean and well-arranged. On one side two small rooms had been built of adobe, one for the chief, and the other for storing baskets of manioc, each of which held about a hundred pounds.

A walk around the edge of the clearing disclosed an obscure trail which zigzagged and wound through the forest about a mile and then opened into an immense plantation. This we estimated contained not less than a hundred acres. The trees had been cut down and burned, and yucas neatly planted in hills stretched to the very edge of the clearing. Through the center ran lanes of plantain and banana plants, bordered by rows of pineapples, sugar-cane, and cashews. The ground was carefully cultivated, and there were no weeds; the stalks of uprooted plants had been piled around the edge of the field, forming a thick fence. The reason for maintaining such large plantations is that the women make a good deal of

manioc to sell to the traders for cloth, matches, perfume, and trinkets. The men clear the ground; the women plant and care for the crops. From the juice of the yuca a very intoxicating drink called *casiri* is made, and of this great quantities are consumed during the wild orgies that take place at frequent intervals.

We found the forest around camp to be all but impenetrable on account of the underbrush and creepers. Also, there were a number of windfalls where cyclones had cut wide, clean swaths through the forest, leaving an upheaved barrier that could not be crossed without the liberal use of ax and *machete*. Small birds were abundant and traveled in large, mixed flocks. Of the bigger birds there was an unfailing supply; guans and curassows strutted unconcernedly about, or flew into the lower branches of the trees to look with surprise or resentment at the intruder; large tinamous ran about in pairs like chickens and were slow to take wing. Occasionally we ran into a flock of trumpeters *(Psophia)* that stared at us in curiosity for a few moments and then flew into a tree and raised an unearthly din, cackling and screaming until dispersed by a few shots.

The Indians told a curious story about a trumpeter and a curassow. In the very beginning of things, two of these birds decided upon a matrimonial alliance, but domestic troubles soon broke out and there was no possibility of a reconciliation; it was thereupon decided to lay the case before the gods who live on the summit of Mount Duida. The wise gods ordered them to fight it out; in the course of the combat that followed, the curassow pushed the trumpeter into the fire, burning off the feathers of the latter's tail; the trumpeter promptly retaliated by pushing her mate into the fire, singeing his crest. Thereupon the gods decreed that they should remain in this humiliating plight for the rest of their days, and so even to this time the curassow wears a curled crest and the trumpeter has a very short tail.

No matter how far we chanced to go during the morning's hunt, it was always easy to determine the exact location of our camp. A large colony of *cassiques* had built their nests in the top of a tree near the tent, and quarreled and chirped so noisily all day long that we could not get out of hearing of them.

After the trail had been completed for a distance of several miles, hunting was rendered much easier. It was a delight to wander noiselessly along the clean path and watch the wild things pursuing their daily activities. Tapirs slid quietly across the narrow lane, like shadows; but if disturbed crashed through the brush and thundered away like frightened horses. Large red squirrels frisked in the trees or fed in the nut-bearing palms. Monkeys were always about; there were red howlers, cebus, and small black woolly monkeys with gold-colored hands; the latter traveled in small troops and raced through the tree-tops at great speed, making long jumps from branch to branch; at frequent intervals during the morning

and evening they raised their voices in shrill little cries of distress resembling a series of quickly repeated Oh's.

The river was teeming with fish. At night, after their work had been completed, the Indians, who camped on the water's edge, threw in their lines and never failed to catch a goodly supply. While in our presence the men always wore blue cotton trousers and the women loose dresses of the same color; but when alone they threw aside all clothing.

Occasionally a light canoe containing women and children passed our camping site, but they always remained as near as possible to the opposite bank and paid no attention to us whatever if we chanced to call to them; in fact, they could not even be induced to look in our direction.

The nights were always sultry and it rained frequently. If the weather permitted, a huge fire was built; into this a steady stream of fireflies or click-beetles winged their way to destruction. Late one night we heard a queer pattering on the top of the tent-fly; back and forth raced little, scurrying feet, and up and down the sloping roof. Our acetylene lamps revealed a family of opossums which had discovered an ideal playground. Often, too, we heard cautious footsteps near by, and the suddenly flashed light disclosed the glowing eyes of a deer, tapir, or jaguar which gazed stupidly a moment into the dazzling brilliance and then darted away.

On account of the dampness, mould formed so rapidly that cameras and all leather goods had to be cleaned daily, and there was great difficulty in drying specimens.

We had frequent views of Duida. Each morning at about ten the mist drifted from the summit and revealed the jagged, rocky peaks; our calculations placed the altitude of the mountain at approximately 5,500 feet above the river. Toward the Orinoco, the mass presents a bold front, the sheer walls of granite rising to a height of several thousand feet. The western slope is gradual, and any attempt to ascend the mountain should be made from that side.

Cutting the trail required more time than we had anticipated. It was our intention to remove the equipment to the very base of Duida, and this was impossible until a suitable way had been prepared. The intervening country is rolling and the hollows are filled with a network of deep, water-filled canyons; across these, trees had to be felled to provide a means of crossing. Neither the Maquiritares nor the Venezuelans proved to be very industrious; in fact both were about as poor a class of assistants as could be found. However, work progressed steadily, and there came the day when the last bridge had been placed across the winding river, and we were able to proceed to the foot of our goal.

Near the mountain, the vegetation assumes a different aspect. Instead of the tall forest, there are vast groves of palms which form such a dense canopy that the sunlight never penetrates to the ground; for this reason there is no undergrowth, but the earth is covered with a soft carpet of dry

leaves. Some of the palms attain such giant proportions, with fronds thirty or forty feet long and fifteen feet wide, that they form great tent-like shelters.

As we neared the mountain the Indians became restive and finally refused to go any farther. They firmly believe that it is the abode of spirits, who will be quick to resent any intrusion into their sacred domain. Besides, the rainy season was fast approaching, and at night blinding flashes of lightning played among the crags, and the dull boom of distant thunder pierced the sultry blackness. Wind swept through the forest in fitful blasts, and it rained frequently. Sometimes the gales attained the velocity of a cyclone and sent tall trees crashing down on all sides. The Indians could endure the strain no longer; so one night they quietly disappeared, taking the boat with them. At first thought this loss seemed anything but pleasant; but a raft was soon constructed, and two of the men were sent down to the nearest rubber camp on the Orinoco for another craft. We never saw the Indians again; but one afternoon two men of the tribe visited our camp. They emerged silently from the forest, having concealed their canoe somewhere above or below, laden with baskets of plantains, sweet potatoes and bananas, and several cakes of cassava bread; also, a large, freshly killed curassow—enough provisions to keep two men a week. I thought they wanted to stop with us for the night and showed them the fire-place. They paid no heed to my implied invitation but dropped their burdens at our feet, reluctantly accepted a few fish-hooks which were offered to them, and then departed as mysteriously as they had come. Perhaps they had been sent by our erstwhile companions, who may have been conscientious enough to make some reparation for the theft of the canoe.

The rainy season advanced with such rapid strides that further work was impossible. Vapor hung over the forest like a pall for days at a time, and the river, rising with each passing hour, was quickly inundating the lowlands. The sight of the new canoe coming up the river was therefore a welcome one, and it did not require many days to pack our collections and outfit, stow them aboard, and steer a course downward with the rapid current. It required only nine days to reach San Fernando de Atabapo.

The results of the expedition are surprising and interesting. Duida is not the isolated "mountain island" it was commonly supposed to be, but is connected with the mountains of the Ventuari and Parima by a series of hills, some of which reach a height of over a thousand feet. Its elevation is comparatively low, being less than that of the Maravaca; to attempt its ascent from the Orinoco side seems hopeless on account of the frowning precipices facing the plains near Esmeralda. The proper placing of the Cunucunuma and an elaboration of the map of the region were further results.

It should be remembered that the dry season is much shorter on the upper Orinoco than on the lower river, and work must be pushed with the utmost speed. The tributaries of the Orinoco as well as the main river leave their banks soon after the beginning of the steady downpours, and the whole country is flooded many miles inland; all the rubber camps we had seen on the upward trip were totally deserted when we passed them going down, and of some of the huts the roofs only showed above the water; others had vanished with the yellow flood.

The collections of birds and mammals were large and interesting; they yielded a number of species and one genus new to science.

Finally, a word about assistants; under no circumstances should Venezuelans or Indians be depended upon. It is possible to secure experienced river-men in Trinidad, and, with proper treatment, they make faithful and efficient companions.

EARLY EXPLORATION OF THE CHURCHILL RIVER

By J. B. TYRRELL

In the *Review* for December, 1916, Mr. Alcock gave an interesting account of the Churchill River,[1] the second in size of the two largest rivers that empty into Hudson Bay from the west. As the history of the exploration of this river is but slightly known, a few additional facts about the early surveys and journeys made on it may be of interest.

After its discovery by Jens Munck in 1619 very little attention was paid to the river until after Captain Gazer (Geyer) of the Hudson's Bay Company built York Factory on the northwest bank of Hayes River in 1684.[2] In 1688 the same company established a fishery for white porpoises at the mouth of the river. The existence of this fishery is recorded on an old French map of Hudson Bay, a copy of which is in the possession of the Canadian Archives in Ottawa. It is undated, but internal evidence shows it to have been made between 1691 and 1694. On this same map the Churchill River is shown up to and a little above the confluence of the Deer River, or for about thirty miles upwards from its mouth.

About 1718 the Hudson's Bay Company built a trading post within the mouth of the river, and in 1733 it began the construction of Fort Prince of Wales, the great stone fort on Eskimo Point.

In the years 1769 to 1772 Samuel Hearne made his three journeys inland from this fort, but he appears never to have made any attempt to survey the Churchill River, for on the great map of the world accompanying the account of Cook's third voyage,[3] which was issued in 1784, no indication is given of the course of the river above its mouth, though all the geographical information in the possession of the Hudson's Bay Company appears to have been incorporated on this map, including Hearne's surveys towards the Coppermine River, and two routes from York Factory to Cumberland House (approx. 54° N. and 102° W.) on the Saskatchewan River, one by the Nelson and Grass Rivers and the other by Hayes River and Lake Winnipeg. On the map in Hearne's own book on his journey,[4] published in 1795, the mouth of the river alone is indicated.

In 1775 Joseph Frobisher, a fur trader from Montreal, urged his canoes westward to Lake Superior and thence onward through Lake Winnipeg

[1] F. J. Alcock: The Churchill River, *Geogr. Rev.*, Vol. 2, 1916, pp. 433-448.

[2] For location of most of the geographical features here mentioned, see map in Mr. Alcock's article, p. 434.

[3] A Voyage to the Pacific Ocean Undertaken by the Command of His Majesty for Making Discoveries in the Northern Hemisphere, ... Performed under the Direction of Captains Cook, Clerke, and Gore in His Majesty's Ships the *Resolution* and *Discovery*, in the years 1776, 1777, 1778, 1779, and 1780, 3 vols., Published by order of the Lords Commissioners of the Admiralty, London, 1784.

[4] Samuel Hearne: A Journey from Prince of Wales's Fort in Hudson Bay to the Northern Ocean . . . . in the Years 1769, 1770, 1771, and 1772, London, 1795.

and up the Saskatchewan and Sturgeonweir Rivers to the Churchill River, which he reached at Frog, or Trade, Portage. Here, overlooking the river, the upper waters of which he had now discovered, he established himself for a time. His object was to intercept the northern Indians as they came down from the Athabaska country in their canoes loaded with furs to trade them for guns, ammunition, knives, and "English brandy" with the Hudson's Bay Company at Fort Prince of Wales. In this enterprise he was so successful that he was not able to carry away all the furs that he secured, and he established trade relations with the Indians from the Athabaska country which were maintained by him and by the company with which he was connected for the next forty-seven years.

The following year Alexander Henry and the brothers Joseph and Thomas Frobisher, all from Montreal, left the trading post on the shore of Beaver Lake in the present Province of Saskatchewan, in which they had been living, and went to Frog Portage, where they built a house. As the Indians from Lake Athabaska had not arrived they paddled up the Churchill River to meet them, going about as far as the mouth of the Mudjatick River (56° N. and 107⅔° W.), where they met a band with canoes loaded with furs. They turned about and came back with them to the house at Frog Portage, where they obtained from them 12,000 beaver skins, "besides large numbers of otter and martin," giving in return such articles as they had at the house.

After such a successful trade Alexander Henry and Joseph Frobisher returned to Montreal, while Thomas Frobisher went up the Churchill River to Isle à la Crosse, where he established a trading post.

In 1778 Peter Pond followed Frobisher's route from the Saskatchewan River by Frog Portage and up the Churchill River to Isle à la Crosse, whence he continued to its source near Methye Portage on his way to Lake Athabaska.

A few years later Pond drew several maps of western Canada, one of which is said to have been made for the Empress of Russia. One of these maps, dated 1785, has been published by L. J. Burpee in his "The Search for the Western Sea,"[5] while another, dated about 1790, has been published in the "Report of the Archives of Canada."[6] These maps are crude and imperfect, but the former one is the first that shows the Churchill River from its source to its mouth.

In 1787 Malcolm Ross, who four years later was associated with Philip Turnor in the survey of the upper Churchill River and Lake Athabaska, ascended the Churchill River from its mouth and crossed to Cumberland House on the Saskatchewan River, though by what route is not exactly known. It is probable that he went up the river through Northern and Southern Indian Lakes, and by Nelson House (56° N. and 100½° W.) and the upper waters of the Burntwood and Grass Rivers. Of this trip he

[5] Toronto, [1908], p. 182. [6] 1890, p. 53.

reported that he had "many difficulties to encounter before he reached Cumberland House from Churchill, the water so shoal as to prevent the navigation of small canoes." In commenting on the results of his trip Samuel Hearne says "no less could be expected; this river a little distance from here is inaccessible for anything much heavier than a light canoe." In 1788, however, Robert Longmore, an employee of the Hudson's Bay Company, was sent "to prosecute the discoveries from Churchill inland." Though he did not succeed in opening a trade route to the Saskatchewan, several trading posts were shortly afterwards established by the company up the Churchill River and in its vicinity.

In 1791 Philip Turnor, accompanied by Malcolm Ross, in charge of a survey party sent out by the Hudson's Bay Company to survey and locate the position of Lake Athabaska, left Cumberland House on Saskatchewan waters, surveyed the Sturgeonweir River up to Frog Portage, and thence made a track survey of the Churchill River up to its sources in Methye and Swan Lakes. His report and map were sent to the head office of the Hudson's Bay Company in London and his map was incorporated in Arrowsmith's map of North America.[7] His original map, which appears to have been remarkably correct, was copied by Kohl, and the copy is preserved in the Library of Congress in Washington.[8] A copy of this copy is published in Burpee's "The Search for the Western Sea."[9]

In 1793 David Thompson,[10] then in the employ of the Hudson's Bay Company, crossed Burntwood Portage (55½° N. and 100° W.) from the Burntwood River into the Churchill River and surveyed that river to a point 33 miles above Duck Portage (55⅔° N. and 102° W.).

He again reached Duck Portage in 1795, where he met George Charles, an old schoolmate of his and then a fur-trader in the employ of the Hudson's Bay Company at Churchill, who had ascended the Churchill River to this place. Though in the employ of the same company the two men occupied separate trading posts, and, while competing with *Canadian* traders from Montreal, they also competed with each other for the furs that were caught and brought to them by the Indians, and they sent the furs obtained in the winter's trade to different headquarters, Thompson sending his furs down the Burntwood and Nelson Rivers to York Factory and Charles down the Churchill River to Fort Churchill.

In 1796 Thompson surveyed the Churchill River from Duck Portage up to the mouth of the Reindeer River, the Reindeer River to Reindeer

[7] See footnote 13.

[8] Justin Winsor: The Kohl Collection (now in the Library of Congress) of Maps Relating to America (a reprint of *Bibliogr. Contribution of the Library of Harvard University No. 19*), Library of Congress, Washington, 1904, map No. 39, listed on p. 74.

[9] p. 170.

[10] For an account of this eminent trader and surveyor's explorations see J. B. Tyrrell: David Thompson, A Great Geographer, *Geogr. Journ.*, Vol. 37, 1911, pp. 49-58, and "David Thompson's Narrative of His Explorations in Western America, 1784-1812," edited by J. B. Tyrrell, Toronto, 1916 (reviewed in the February *Review*, p. 156).—EDIT. NOTE.

Lake, and the west side of the lake up to the portage route to Wollaston Lake, beyond which he surveyed Wollaston Lake and Black River to the east end of Turnor's survey of Lake Athabaska. In 1797, while in the employ of the North-West Company, he surveyed the Churchill River from the mouth of the Reindeer River to Frog Portage, on his way to Cumberland House, and the following year he surveyed the river from Frog Portage upwards to Isle à la Crosse, making a detour on the route into Lac la Ronge. From Isle à la Crosse he ascended Beaver River, the principal upper branch of the Churchill River, past Green Lake to the source of the stream, whence he carried his canoes to Lac la Biche, where he built a trading post. In May, 1799, he was on the Clearwater River, a branch of the Athabaska, which he ascended to Methye Portage, from which place he surveyed the Churchill River down to Isle à la Crosse, and thence checked his survey of the river made the year before down to Frog Portage.

The absurdity of maintaining two sets of trading posts on the Churchill River and the upper waters of the Burntwood River, both belonging to the Hudson's Bay Company, but one sending its furs down the Churchill River to Churchill and the other down the Burntwood and Nelson Rivers to York Factory, was recognized in 1798, and the chiefs at York Factory recalled their traders and left the district to the men from Churchill. From that time onwards until 1821, when the Hudson's Bay and North-West Companies united under the former name, and perhaps for several years after the union of the companies, the furs from this district which were secured by the Hudson's Bay Company were carried down the Churchill River to Churchill, whence they were shipped to England.

In 1799 a trading expedition was sent from Fort Churchill up the Churchill River all the way to Green Lake on the Beaver River. It left Churchill on June 26 in three boats and one or two canoes in charge of Messrs. Thomas Stayner and William Auld. Everything went well for a while, but at about 130 miles from the fort, somewhere near the mouth of the Little Churchill River, the canoe containing the two principals was upset in a rapid, and, though the men were saved by the accident of the tracking line becoming entangled in the loose rocks in the bottom of the river, the contents of the canoe were lost. On this account Stayner returned to Churchill, while Auld continued up the river and established a trading post on Green Lake, where he spent the winter. On his arrival there he was greatly distressed to find that he had not brought enough brandy with him, but on his appealing to some of the posts on the Saskatchewan River they helped him out.

In the same year Peter Fidler of the Hudson's Bay Company, under direction from York Factory, left Cumberland House on the Saskatchewan waters and went by Frog Portage to the Churchill River, thence up that river and its tributary, Sturgeonweir River, to Green Lake and Lac la Biche. Thus Fidler and Auld, one from York and the other from Churchill,

transferred the rivalry of these two centers from the country on the lower to that on the upper portion of the Churchill River.

In 1804 and 1805 David Thompson, on behalf of the North-West Company, was trading and surveying on the Churchill River as far downstream as Southern Indian Lake, which was as far as he ever descended. During this season and the preceding twelve years he had made track surveys, checked by great numbers of astronomical observations, of the river down to this lake from its three principal sources, one at the head of the Beaver River, near Lac la Biche (54¾° N. and 112° W.), and the others in Methye and Wollaston Lakes. He never had the opportunity of traveling over that portion of the river from Southern Indian Lake down to Hudson Bay.

In the winter of 1804-1805 Thompson was opposed in the fur trade by his old schoolmate George Charles of the Hudson's Bay Company, who, like himself, had received a rudimentary education in surveying at the Grey Coat School in London, though there is no published record that he ever made use of his early training.

At that time there were three fur-trading posts on this lower portion of the Churchill River, namely (Southern) Indian Lake, Granville Lake, or Musquawegun, and Nelson House. William Conelly, afterwards so well known in connection with the Hudson's Bay Company's affairs in British Columbia, was in charge for the North-West Company at Indian Lake, David Thompson for the same company at Musquawegun, and George Charles for the Hudson's Bay Company at Nelson House.

The following account of an incident which occurred during the previous year in the conduct of the fur trade at Nelson House is given in Thompson's own words[11]:

Oct. 2. In the evening paid a visit to Mr. Charles to enquire the reasons of his seizing Louis Duplein. He informed me that in the spring on the arrival of all their party at this place, a Mr. Clarke deposed that Louis Duplein entered his tent with arms and forcibly took from thence a bundle containing 30 beaver skins, and that another small bundle of furs had been stolen out of his tent in the night previous to the above, the wrapper of which small bundle he found in the morning at the door of the said Louis Duplein. They all then proposed to seize him and take him down to Churchill to be tried as Criminal for the above actions; but that he Mr. Charles overruled the motion as not thinking it an affair of sufficient consequence to cause such violent measures. But upon the arrival of Mr. Linklater &c. at the Factory (Fort Churchill) they by their representations to the Trader there got an order to seize on the person of Louis Duplein, commanding all persons that should be found present to be aiding in seizing the said Louis Duplein. In consequence of which, when they arrived in the summer, after having settled their affairs and ready to return to the Factory, they invited Louis Duplein to breakfast, which invitation like a blockhead he accepted (for they had no intention of entering the N. W. Co.'s House to seize him). At breakfast they asked Louis Duplein if he actually took by force the above 30 skins from Mr. Clarke, to which he replied in the affirmative, owning his guilt and offering to pay half the skins on the spot. Having thus declared himself guilty they were obliged to seize him and put his hands in irons. They then embarked him, leaving orders with their clerk at

[11] Thompson's MS. notebooks in the Provincial Archives of the Province of Ontario, Toronto.

the Indian Lake to aid and assist Du Bois in the care of the N. W. Co.'s property till some person should arrive to take charge of it. He further added that on the arrival of the ship from England the opinions of the Commander and officers of the ship were that Louis Duplein would be hanged, and that they did not see any likelihood of his escaping the rigour of the law.

Several years before Thompson reached Indian Lake some one, doubtless one of the men in the employ of the Hudson's Bay Company, had made a survey of the lower portion of the river, for in the general map accompanying Mackenzie's "Voyages,"[12] which is dated October 15, 1801, this portion is shown with a rough approximation to correctness up to about the position of Nelson House in 55° 50′ N. and 100° 30′ W. Above that, up to near the mouth of the Reindeer River, it is shown by a dotted line. The positions of the lakes are merely indicated on this map without shores on either side, giving the impression that the surveyor, like many another surveyor down to the present day, noted his directions and distances, but made no attempt to sketch in the surrounding country. It is clear also that the map was not copied from a sketch made by an Indian, for in that case there would have been some indication of the shapes of the lakes. This map is said to have been "reduced by Mr. Arrowsmith from his three-sheet map of North America, with the latest discoveries, which he is about to republish."

In the 1802 edition of Arrowsmith's own map[13] the dotted line on the above map is replaced by a solid one, but no details are indicated.

Later surveys of the lower part of the river made during the early part of the last century appear to have been the work of Peter Fidler.[14] In 1807 he repeated some of Thompson's surveys of the Reindeer River and Reindeer Lake. In 1809 it is probable that he made a survey of the Churchill River from its mouth up to Isle à la Crosse, and in the following year that he surveyed the Seal and Paukatakuskow Rivers, north of Churchill, from Hudson Bay to Southern and Northern Indian Lakes respectively, as all these three streams are shown on the edition of Arrowsmith's "Map of the Interior Parts of North America" dated June 14, 1811.

From that time onward till 1879, when Robert Bell of the Geological Survey of Canada descended the river from the confluence of the Little Churchill River to its mouth, nothing was added to the knowledge of the geography of the lower part of the river.

As stated above, the Churchill River was regularly used as a trade route from about 1792 down to the time of the union of the Hudson's Bay

[12] Alexander Mackenzie: Voyages from Montreal on the River St. Lawrence, Through the Continent of North America, to the Frozen and Pacific Oceans, in the Years 1789 and 1793. London, 1801.

[13] A Map Exhibiting All the New Discoveries in the Interior Parts of North America, Inscribed by Permission to the Honorable Governor and Company of Adventurers of England Trading into Hudson Bay, in Testimony of Their Liberal Communications to Their Most Obedient and Very Humble Servant, A. Arrowsmith. January 1st, 1795. [1:4,500,000]. London, A. Arrowsmith, 1795; additions to 1802.

[14] See J. B. Tyrrell: Peter Fidler, Trader and Surveyor, 1769 to 1822, *Proc. and Trans. Royal Soc. of Canada*, 3rd Series, Vol. 7, 1913, Section 2, pp. 117-127.—EDIT. NOTE.

and North-West Companies in 1821. In this latter year there were two districts on the river and in its vicinity, known respectively as Old and New Churchill Districts. In Old Churchill District there was only one trading post, namely, Fort Churchill, near the shore of Hudson Bay. In New Churchill District there were in all five trading posts, three of which, namely, Indian Lake, Nelson House, and Reindeer Lake, were on the Churchill River or its tributaries, while the other two at Net (Setting) and Split Lakes were on the waters of the Nelson River. The Chief Factor, John Charles, had his residence at Indian Lake, and every year he brought supplies up the Churchill River from Fort Churchill, and distributed them to the above-named trading posts, after which he collected the furs from these posts and took, or sent, them down the same river to Fort Churchill to be shipped to England.

A few years after this date, but just how many I do not know, the number of trading posts maintained by the company was considerably reduced, and several of the more northern ones were abandoned, including most of those on the lower portion of the Churchill River, for the old-time competition between the North-West and Hudson's Bay Companies was now a thing of the past, and, as the Indians were confined to the traders of the Hudson's Bay Company for their supplies, they could be depended on to come much longer distances to the trading posts than formerly. About the same time the Churchill River was abandoned as a trade route from the interior country to the coast; the Indians soon ceased to travel up or down its treacherous current; and before long the fact that it had ever been used as a regular trade route was almost entirely forgotten.

THE HISTORY OF THE FORTY-NINTH PARALLEL SURVEY WEST OF THE ROCKY MOUNTAINS

By OTTO KLOTZ

The object of this paper is to tell the—one may almost say—romantic story of the survey in 1857-61 of the boundary between the United States and Canada along the forty-ninth parallel west of the summit of the Rocky Mountains and to relate how the final report, which had been lost until that time, was found in July, 1898.

In order to give adequate meaning to that discovery, it is necessary to review briefly the history of the boundary line. By the treaty of June 15, 1846, signed by James Buchanan and Richard Pakenham, between the United States and Great Britain, Article I, describing the boundary line, reads[1]:

> From the point on the forty-ninth parallel of north latitude where the boundary laid down in existing treaties and conventions between the United States and Great Britain terminates, the line of boundary between the territories of the United States and those of Her Britannic Majesty shall be continued westward along the said forty-ninth parallel of north latitude to the middle of the channel which separates the continent from Vancouver's Island, and thence southerly through the middle of said channel and Fuca's Straits, to the Pacific Ocean: *Provided, however,* That the navigation of the whole of said channel and straits south of the forty-ninth parallel of north latitude remain free and open to both parties.

In the official correspondence of the time the section of the boundary between the summit of the Rocky Mountains and the Strait of Georgia is spoken of as the "land boundary" to distinguish it from its western continuation through the strait separating Vancouver Island from the mainland, which was designated the "water boundary." Throughout this article the land boundary, along the forty-ninth parallel, is alone considered.

It was not until ten years later, on August 11, 1856, that Congress authorized the appointment of a commission which, with a similar commission to be appointed by Great Britain, was to carry out the provisions of the above Article I. Archibald Campbell was appointed the United States commissioner and Col. J. S. Hawkins the British commissioner, and Major J. G. Parke and Capt. R. W. Haig were appointed the respective astronomers. Field operations were begun in 1857 and concluded in 1861. It is interesting to note the arrangement made August 13, 1858, by the joint commission[2]:

> After discussing plans for determining and marking the line as far eastward [from the Strait of Georgia] as the Cascade Mountains, it was concluded to be inexpedient

[1] Treaties and Conventions Concluded between the United States and Other Powers, State Dept., Washington, 1889, p. 438; also *U. S. Geol. Survey Bull. 226*, 1904, p. 19.

[2] Foreign Office Correspondence, Part III, p. 16, Office of the Chief Astronomer, Dept. of the Interior, Ottawa, 1899 (see also footnote 6).

at the present time, in consequence of the great expense, consumption of time, and the impracticable nature of the country, to mark the whole boundary by cutting a track through the dense forest. It was therefore agreed to ascertain certain points on the line by the determination of astronomical points at convenient intervals on or near the boundary, and to mark such astronomical stations, or points fixed on the parallel forming the boundary, by cutting a track of not less than 20 feet in width on each side for the distance of half a mile or more, according to circumstances. Further, that the boundary be determined and similarly marked where it crosses streams of any size, permanent trails, or any striking natural features of the country. In the vicinity of settlements on or near the line, it is deemed advisable to cut the track for a greater distance, and to mark it in a manner to be determined hereafter.

Although the survey was completed late in 1861 it was not until May 7, 1869, that the final report was signed at Washington by the two commissioners. A very important agreement[3] was reached on that day by the two commissioners, when they decided—

that, between any two successive defined points, marked on the ground, shown on the maps, and set forth in the accompanying lists, the line of boundary above described is to be considered a right or straight line; and that this rule is to apply throughout the entire boundary without regard to the distances between the consecutive points or to the course of the parallel in such intervals.

Colonel Hawkins, writing on May 10, 1869, to the Foreign Office and referring to this agreement, says[4]: "We were induced to do this upon consideration that it was of the greatest importance nothing should be left for *future* discussion or settlement and that our operations should be final and conclusive."

It should be observed that the observations of the two commissions were made with the utmost attainable precision and are comparable with the best field work of today. The position of the parallel in the 410 miles of its length was determined from twenty-eight astronomical stations, eleven of which were established by the British commission, fourteen by the United States commission, and three by joint observations. The total expense of the United States commission was approximately $600,000, equivalent to about $1,460 per mile. We may assume that the expense of the British commission was about the same, although the figures are not available. Ultimately the maps of the survey were published, seven sheets on the scale of 1:60,000 (see index map, Fig. 1).[5]

Such were the methods used in establishing the boundary line, which cut across a wild, generally forested country with no population save in isolated spots. Where is the boundary? and Which line is it? were questions that arose later with the advent of settlers in the more open country between the Similkameen River and the Columbia.

As squatters and settlers began to occupy lands on both sides of the boundary line they found in places three lines cut through the woods, as well as two sets of stone cairns, which naturally left them in a quandary

[3] *Ibid.*, Part IV, p. 7. [4] *Ibid.*, p. 5.
[5] And publication cited in footnote 9, pp. 22-23.

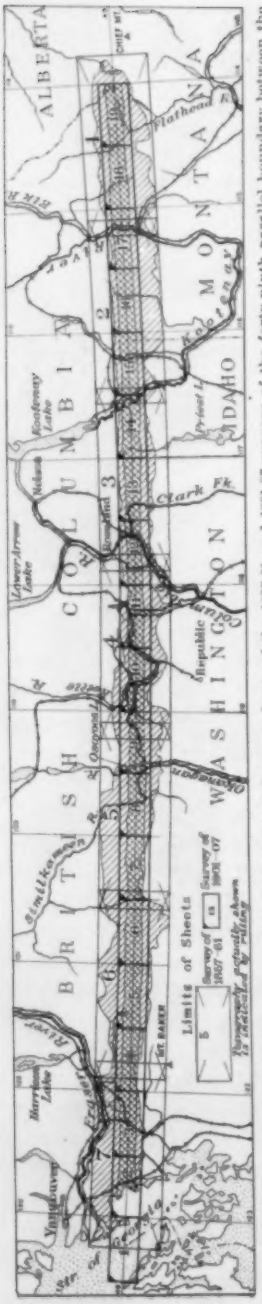

FIG. 1—Index map showing the limits and arrangement of the map sheets of the 1857-61 and 1901-07 surveys of the forty-ninth parallel boundary between the United States and Canada west of the summit of the Rocky Mountains. Scale, 1:4,000,000, or about 63 miles to 1 inch. The ruling indicates the extent of the topography actually shown in each case.

as to where the definite boundary line was. Settlers on the Canadian side applied to the provincial government at Victoria for the necessary information. But none could be supplied from that source. That government referred the question to the federal authorities at Ottawa, but here, too, no records were available. It seemed obvious that it would only be necessary to write to London to obtain the desired information and a copy of the final report of the survey of 1857-61. Now the extraordinary happened. This final report with the necessary data of the survey was not to be found in London. Time and again search was made by different persons for the missing documents, but all to no avail. To add to the remarkable situation, the duplicate final report was not to be found in any of the government archives in Washington. Does history record any similar circumstance? Two governments are engaged for years on an expensive international work, a boundary survey; the respective commissioners sign joint final reports and transmit them to their respective governments; and the reports are nowhere to be found! The apparently impossible had happened, and the outlook was that in the near future a new survey under another international commission would have to be made.

Such was the situation in 1898 when the writer was sent by the Dominion Government to London and Petrograd on a special mission, in which was included the obtaining of information regarding the records and final report of the survey. All the Government offices in London were visited in which there was the faintest likelihood that the records might be stored, but all to no avail, and no one seemed to be able to give any assistance. Before leaving England, however, the writer, as astronomer for the Dominion Government, naturally paid a visit to the Royal Observatory at Greenwich. By chance his eye caught the initials B. N. A. on some boxes on top of

the library shelves—letters at once interpreted as possibly standing for "British North America." The boxes were taken down, the dust of years removed, and in them lay the long-lost records of the international survey of the forty-ninth parallel.

The final report, dated May 7, 1869, and jointly signed by the two commissioners, together with other official correspondence pertaining to the boundary, has since been published by the Office of Chief Astronomer, Department of the Interior, Ottawa.[6]

With the material found it was now possible to understand all the operations of the survey, the method of placing the monuments, the reason for the existence of diverging lines cut through the forest, and the meaning of duplicate cairns. The occurrence of the last was due to the non-removal by the men as instructed of those cairns which no longer indicated the position of the accepted boundary line.

In order to understand how and why unavoidable difficulties arose in making the demarcation of the boundary line continuous, it is necessary to say a word about astronomical observations for latitude. The zero from which latitude observations are made is indicated by the "level," and its position in turn is the resultant of all the gravitational forces acting on it. Mountainous regions generally show deflections of the plumb line, due to anomalous distribution of matter. Were there no anomalies it would be possible theoretically, after establishing an individual point on any parallel of latitude, to establish other points on the parallel from it. Or we may say that, if two points are established, the direction a straight line must take from the one point to the other is simply a matter of computation. In the present case the effect of this condition was most noticeable in the 96 miles from the Similkameen River to the Columbia, where most of the duplicate cuttings in the forest were found. In a letter dated March 28, 1861, and addressed to the Secretary of State, Colonel Hawkins said[7]:

> If the actual boundary was to be defined by the joint commission in any part of the space intervening between the waters of the Pacific and the Rocky Mountains, the interval between the Similkameen and the Columbia Rivers is not only of as much importance as, if not of greater importance than, any other part of the line, but it also presented greater facilities for the performance of the necessary operations, while it embraces about a fourth of the whole extent of land boundary comprehended in the treaty under which the commission was appointed.

The astronomic stations in this section of the boundary were, in order from west to east: Similkameen (119° 35′ W.; U. S.); Osoyoos (119° 24′; Br.); First Crossing, or Newhoilpitkw (118° 44′; U. S.); Second Crossing, or Inshwointum (118° 28′; Br.); Third Crossing, or Statapoosten (118° 16′; U. S.); Columbia (117° 38′; Br. and U. S.). It will be remembered that it was agreed to project the boundary line a short distance east and west from each astronomic station. This was done. From the British

[6] Foreign Office Correspondence, Parts III and IV, Ottawa, 1899.
[7] *Ibid.*, Part III, p. 41, Ottawa, 1899.

station at Osoyoos, the British commission ran lines—cutting the forest where encountered—west and east to meet the United States astronomic stations respectively at Similkameen and at the First Crossing, and similarly from the Second Crossing again to the First Crossing and eastward to the Third Crossing. The not-unexpected happened—the lines did not meet, owing to "local deflection of the plumb line," although the discrepancies were greater than expected. At Similkameen the line came 509 feet north of the United States station; at the First Crossing the Osoyoos line came 364 feet north of the United States station, but the line projected from the Second Crossing westward came 300 feet south of this same United States station; i. e., the two British lines run from British stations were 664 feet apart. This was not attributable to any error in the work, for the work was well done, but to the inherent idiosyncrasies of the environing mass distribution. Because of this operation of connecting or trying to connect the astronomic stations there now were two lines cut at each of the three United States stations. Things could not be left in this condition. After discussion by the officers of the two commissions on March 4, 1861, "it was agreed that a mean parallel should be adopted, and a new line run and marked from the Similkameen to Statapoosten."[8] And this new line was run and marked by the United States commission. Thus in places a third line was cut; this was the definitive line. This explains why on the ground several vistas through the woods existed side by side. From the position of the mean parallel at Statapoosten the British commission subsequently ran the line to connect with the astronomic stations on the Columbia. Here, too, the line suffered a deflection to the north, namely, of 212 feet. As already mentioned the cairns should all have been removed from the preliminary lines joining astronomic stations and only those left which were on the final line. The circumstance that this was not done added to subsequent mystification; but the finding of the original records and final report cleared up everything.

It may be interesting to continue the story and recount what happened in Washington. Marcus Baker, cartographer, made a report[9] on June 9, 1900, to the director of the U. S. Geological Survey on this boundary line. He searched the various departments in Washington for documents pertaining to the survey and had personal interviews and correspondence with men then living who had been officially connected with the boundary survey, with a view to throwing light, if possible, on "the most important document of all," the final report, but failed. Baker quotes[10] from the 1889 report of Capt. George M. Wheeler, U. S. A., as follows:

> I have been unable to trace the manuscript of the final report, including that of the chief astronomer and the specialists, which it was believed was made. According to the Journal of the Senate of February 9, 1871, this report was called for by the Senate,

[8] Foreign Office Correspondence. Part III. p. 57. Ottawa. 1899.
[9] Survey of the Northwestern Boundary of the United States. *U. S. Geol. Survey Bull.* 174, Washington, 1900.
[10] *Ibid.*, p. 11.

but a search of the Senate records and also those of the State Department, made at my request by Mr. Dwight, librarian of the State Department, remained unavailing on June 15, 1887. Mr. William J. Warren, secretary of the commissioner [and] now chief clerk [in the office] of the [Chief of] Engineer[s], [War] Department, recollects to have seen the manuscript of this report at the office of the Northern Boundary [Survey], established in 1873, as does also Major J. F. Gregory, Corps of Engineers, a member of that commission, but it could not be found by Mr. Dwight in the records transmitted at the close of the latter survey to the State Department.

Baker adds to the above: "The search above mentioned I have now repeated and with like result. The manuscript has not been found." Farther on[11] Baker writes: "But the report, unfortunately, was not published, and the manuscript has for many years been lost to view. Its whereabouts are still unknown. The reason it was not published, I am informed, is that Mr. Fish, Secretary of State at that time, deemed its publication too expensive. The war had brought a mountain of debt, and under these conditions he refused to sanction so costly a publication."

Such were the vicissitudes of the 1857-61 survey. In 1900 it was decided to re-mark the boundary in order that there might be no doubt as to its exact position—a condition made necessary by the increased settlement and economic development of the region. Commissioners were appointed as follows: Dr. W. F. King, Chief Astronomer of the Canadian Department of the Interior, for Great Britain; and Dr. C. D. Walcott, Director of the U. S. Geological Survey, and Dr. O. H. Tittmann, Superintendent of the U. S. Coast and Geodetic Survey, for the United States. The survey was carried out in the years 1901-07, and the final map, in 19 sheets on the scale of 1:62,500, was published in 1913 (see index map, Fig. 1).[12] A network of triangulation was established,[13] monuments were placed at frequent intervals, and in the forested areas a clear sky-line was cut. However, the line, as now marked and cleared throughout, is based on the monuments and positions established in the original survey of 1857-61. The fortunate find of the lost report "doubtless prevented complications which might otherwise have arisen as to the details of the boundary and obviated the necessity of a new treaty or of special provisions in the general treaty."[14]

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[11] *Ibid.*, pp. 17-18.

[12] And review under "North America, General" in the section "Geographical Publications," below.

[13] See diagram in *Rept. Supt. Coast and Geodetic Survey, 1903-1904*, p. 149. For account of the operations of the Survey see the annual reports of this bureau from that for 1902-03 to that for 1908-09.

[14] O. H. Tittmann: Our Northern Boundaries. *Journ. Washington Acad. of Sci.*, Vol. 4, 1914, No. 3.

FURTHER CONTRIBUTIONS TO THE PROBLEM OF ATLANTIS

The discussion in the January *Review*, by Professor Schuchert and Dr. Schuller, of Termier's paper on Atlantis, the "lost" continent, has called forth the following two papers by Mr. Edwin Swift Balch, Councilor of this Society, and Mr. William H. Babcock, a private collector of Washington, D. C., who has recently made an extensive investigation of a related topic from the standpoint of early cartography.[1] The present papers furnish additional material on this vexed problem. The one suggests an identification of locality different from that favored by geologists, which considers the sunken land-mass whose remnants are the Canary and Cape Verde Islands to be the "lost" continent of the ancient myth; while the other discusses the improbability of any connection between the names Atlantis and Antilles.

ATLANTIS OR MINOAN CRETE

By EDWIN SWIFT BALCH

The lost Atlantis of Plato has been for many years if not centuries a subject of discussion and controversy. It is usually assumed to have been located in the Atlantic Ocean somewhere off the coast of the Sahara Desert. This solution of the puzzle, however, has never been definitely accepted, and the matter is constantly being reargued afresh. Professor Termier's interesting paper on Atlantis, recently reviewed in these pages, brings forward anew the theory of the location of Atlantis in the Atlantic Ocean. In view of this, it seems well to say a few words about the theory—briefly mentioned by Mr. James Baikie in his book "The Sea Kings of Crete"[2] and said by him to have been broached by an anonymous writer in an English newspaper a year or two earlier—that the lost Atlantis of Plato is really Minoan Crete.

The theory that Atlantis is Minoan Crete could only have been started since 1900, for up to the end of the nineteenth century Turkish suzerainty over this island of the Ægean prevented all archeological work. But with the first sods upturned by the archeologists's spade great results were obtained. Gournia and Phaistos and Knossos with its fine palace were unearthed, and before long the world realized that in Crete there had once been a totally forgotten civilization which extended over not less than two

[1] The So-called Mythical Islands of the Atlantic in Mediæval Maps, *Scottish Geogr. Mag.*, Vol. 31, 1915, pp. 261-269, 315-320, 360-371, 411-422, 531-541; Vol. 32, 1916, pp. 73-79, 131-140, 418-428, 477-484.

[2] A. and C. Black, London, 1910; reference on pp. 256-259 (see review in *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, pp. 382-383).

thousand years and which came to a sudden end in about the year 1200 B. C. Moreover, during most of its existence the Minoan kingdom was in touch with Egypt; the last Egyptian relics found in Crete, according to Flinders Petrie, date from about the year 1200 B. C., thus apparently coinciding with the downfall of Minoan civilization.

If one looks at Plato's statements about Atlantis, which are republished at some length in Termier's article, it soon becomes apparent that they are a very confused jumble of ideas. This is probably due to several causes. One is that Plato did not hear the story of the Egyptian priest himself, but only heard it at second or rather at third hand. The story as told by the priest himself to Solon was probably confused enough, and when it reached Plato it was still more confused. Then again the story related to an event which happened at the least not less than six hundred years before. Historical records in Plato's time were not kept with anything like the accuracy with which they are kept now, yet just consider what we should know of the invasion of England by William the Conqueror if, from his day to this, there had been absolutely no intercourse between England and America.

One of the facts which it seems can be gathered with some certainty from Plato's narrative is that Atlantis was a large island. Of its surroundings he says: "From this island you could easily pass to other islands, and from them to the entire continent which surrounds the interior sea. What there is on this side of the strait of which we are speaking resembles a vast gateway . . . and the land which surrounds it is a real continent." That is to say, there were other islands near Atlantis and these were in an interior sea near to a continent. These geographical data apply perfectly to Crete and the Ægean Sea.

Another fact which may be extracted with some certainty from Plato's narrative is that Atlantis was a kingdom of some extent and power. Its kings "had under their dominion the entire island as well as several other islands and some parts of the continent. Besides on the hither side of the strait they were still reigning over Libya as far as Egypt and over Europe as far as the Tyrrhenian." These statements may perfectly well apply to Minoan Crete. Crete may easily have ruled over many of the islands of the Ægean, it may well have ruled over the Peloponnesus at the time of Mycenæ and Tiryns, it may well have ruled over the North African coast of the Cyrenaica. This is certainly far more probable than that a people living in the Atlantic Ocean should have ruled over Morocco, Algeria, Tripoli, and the Cyrenaica as far as the valley of the Nile. And if they had they would certainly have left some relics of their occupation, but no relics of any such people have been found in North Africa.

Plato not only tells us that Atlantis was a large island, but he gives a short account of it which Termier condenses or translates as follows: One of Plato's characters, Critias, "describes the cradle of the Atlantean

race; a plain located near the sea opening in the central part of the island and the most fertile of plains; about it a circle of mountains stretching to the sea, a circle open at the center and protecting the plain from the icy blasts of the north; in these superb mountains, numerous villages, rich and populous; in the plain, a magnificent city, the palaces and temples of which are constructed from stones of three colors—white, black, and red—drawn from the very bosom of the island; here and there mines yielding all the minerals useful to man; finally the shores of the island cut perpendicularly and commanding from above the tumultuous sea." Now this is an accurate description of Crete and Knossos, and as far as they are concerned there is nothing fanciful about it.

According to Plato the destruction of Atlantis was the joint work of Egypt and Athens. The old Egyptian priest told Solon "The records inform us of the destruction by Athens of a singularly powerful army . . . All this power was once upon a time united in order by a single blow to subjugate our country, your own, and all the peoples living on the hither side of the strait. It was then that the strength and courage of Athens blazed forth." Apparently Egypt and Athens together put an end to some kingdom threatening them both. And certainly this points to Minoan Crete, whose central location might well have threatened the Egyptian and Athenian allies and whose civilization we know was wiped out absolutely about 1200 B. C.

Is there any recollection of Crete and its destruction in Greek records? It seems as if there were in the shape of the legendary Minotaur, the terrible monster who devoured so many Greek youths and maidens. But, literally translated, Minotaur means the bull of Minos, and we can see in the museums of our chief cities copies of the frescoes from the Palace at Knossos representing the slaughter of Greek prisoners in the Minoan bull fights. And the Minotaur, Greek mythology tells us, was destroyed by Theseus, which would seem to be a reminiscence of the destruction of Minoan Crete by Athenians and Egyptians.

The passage in Plato which has led most strongly to the belief that Atlantis was an Atlantic island, a belief seemingly to some extent justified before the archeological discovery of Minoan Crete, is the following: "The records inform us of the destruction by Athens of a singularly powerful army, an army which came from the Atlantic Ocean and which had the effrontery to invade Europe and Asia; for this sea was then navigable, and beyond the strait which you call the Pillars of Hercules there was an island larger than Libya and even Asia." This is surely a most confused muddle of names and ideas, representing hopelessly confused notions of geography.

Consider the statement that "there was an island larger than Libya and even Asia." The size assigned to Atlantis shows definitely the lack of accuracy of the whole passage. Did the Egyptians or the Greeks of

the year 600 B. C. have any knowledge of the Atlantic Ocean? There is no record of anything of the kind, beyond the one in Herodotus saying that before his time some Phœnician navigators had sailed around the African continent. Is there any warrant for believing that the name "Pillars of Hercules" originally applied to the Rock of Tarik and the mountain masses of Morocco? We should not assume Egyptian and early Greek notions of geography to have been anything like our own. They could not have been. Does not the most probable explanation of Plato's statement seem to be that by the Atlantic Ocean or a navigable sea he meant the Mediterranean and by the Pillars of Hercules some passage between high rocks in the Ægean, rather than what is meant by our present nomenclature?

It is especially in the passages in Plato which are hard to interpret that we must remember that Plato is not telling us something at first hand. Plato tells us that he learned from Solon that an Egyptian priest had told Solon a historical tale which the priest had read in the sacred books. We have thus not the original story as told in the sacred books, but a verbal version of it transmitted verbally through three minds before reaching us. Exactly what was in the sacred books we shall probably never know, but as far as the passage in Plato is concerned which has caused so much speculation—"an army which came from the Atlantic Ocean"—it seems quite possible that the name "Atlantic Ocean" was not in the sacred books at all.

Another passage in Plato is also hard to interpret. "Later with great earthquakes and inundations, in a single day and one fatal night, all who had been warriors against you were swallowed up. The island of Atlantis disappeared beneath the sea. Since that time the sea in those quarters has become unnavigable; vessels cannot pass there because of the sands which extend over the site of the buried isle." "The sea has become unnavigable." What sea? Certainly not the Atlantic Ocean, nor the Mediterranean either! "Vessels cannot pass there" implies commerce on the part of Egypt. But did Egypt ever have any commerce in the Atlantic? Certainly there is no record of anything of the kind. Does it not seem probable that Plato's remarks are a garbled report of the extermination by Egyptians and Greeks of the Minoan Cretans, after which commerce with Crete stopped? At any rate, this explanation would seem to interpret to some extent this perhaps most confused of all the passages in Plato, a passage whose original form in the sacred books was very probably quite different.

The geological evidences advanced of the existence of a sunken continent or island in the Atlantic may be quite accurate. Geologists, however, seem very much in the dark about the time at which such an Atlantic island may have become submerged. They are uncertain as to whether it took place in the Eocene, the Miocene, or the Pliocene. Now supposing such

a submergence occurred even only as late as the Pliocene, what would it mean in regard to Atlantis? Our present, or Recent, short geological period was preceded by the Pleistocene, which was preceded by the Pliocene. The length of the Pleistocene is variously estimated, but a conservative estimate is about 500,000 years. This would place the submergence of the land in the Atlantic, if it occurred in the Pliocene, more than 500,000 years ago. Now can any one seriously maintain that any of the Egyptians, where Dynastic and Predynastic remains can hardly date back over 10,000 years, could have a tradition of an occurrence in the Atlantic dating back more than half a million years?

It is, of course, very probable that there were early men living in the late Pliocene. The famous Piltdown skull, about which so much pother has been raised of late, is considered by many competent archeologists to date from Pliocene times. Piltdown man was also sufficiently different from modern man to have been assigned to a separate class and to have been named after his discoverer *Eoanthropus Dawsoni*. The implements found in connection with the Piltdown skull are of the roughest chipped stone type, eoliths. Now, supposing that there were any Piltdown men on the sunken lands in the Atlantic, could any one pretend to believe that they were capable of building a city and palaces of white, black, and red building stones?

The theory which has been so long and so frequently the subject of controversy, namely, that Plato's Atlantis was in the Atlantic, seems untenable in the light of modern science. The theory that Plato's Atlantis was Minoan Crete, on the contrary, seems to stand up very well before recent archeological discoveries. At any rate it deserves to be more widely known, for it certainly seems to meet fairly completely the facts which the old Egyptian priest was trying to tell Solon and Solon to tell Plato of the destruction of what seems to have been the then already nearly forgotten civilization of Minoan Crete.

ATLANTIS AND ANTILLIA

By WILLIAM H. BABCOCK

In his discussion of Termier's paper in the January *Review* Dr. Schuller charges with *petitio principii* the French geologist's announcement that he awaits "the final answer" to the problem of Atlantis from anthropology and oceanography; also Dr. Hrdlicka's conclusion, from very considerable and persuasive evidence, that the American Indians came from Asia. The ancient and well-worn phrase seems a curious misfit in both instances. Both also are likely to define for a long time—the latter permanently—the general attitude of informed and thinking men.

But real and unwarranted assumption or question-begging is to be found in Dr. Schuller's own utterances. He observes of Atlantis: "As an island it is preserved on the first cartographical productions. After the discovery of America, its name, in the form of 'the Antilles,' was given to the islands at present termed 'West Indies.' "

Clearly, this allusion must be to the delineation of Antillia appearing on the fifteenth-century maps from Beccario,[1] 1435, and Bianco,[2] 1436, onward to the time of Columbus; but not found in the fourteenth-century maps, e. g., Dalorto,[3] 1325; Dulcert,[4] 1339; Laurenziano-Gaddiano,[5] 1351; Pizigano, 1367[6] and 1373,[7] and the slightly later ones of Soleri,[8] Pinelli, etc. Nor is it in Edrisi's twelfth-century maps of the Atlantic islands[9] preserved in the copies of the Pococke and Greaves's Arabic manuscripts. These two versions differ somewhat in details; but no link exists between any Edrisi island and either Antillia or Atlantis. Nor are there any intervening or earlier maps, yet reported, which offer any basis for Dr. Schuller's statement.

Plainly, then, the cartographical survival of Atlantis is found, if at all, not in the "first productions" but in relatively late ones, prepared after portolan-chart makers had been doing their work for about a hundred and sixty years (say from 1275 to 1435), also when Portugal had been for some time the most important agent in maritime discovery and would naturally tend to give any new insular find a Portuguese outline and a Portuguese name. Now, the elongated rectangular form of Beccario's and Bianco's Antillia—repeated also by Pareto,[10] Roselli,[11] Benincasa,[12] and the Weimar map,[13] once attributed to 1424 but now known to be later—appears a suggestion of Portugal; its position may fairly be described as opposite Portugal,

[1] Gustavo Uzielli: Mappamondi, carte nautiche e portolani del medioevo e dei secoli delle grandi scoperte marittime construiti da italiani o trovati nelle biblioteche d'Italia, Part II (pp. 280-390) of "Studi Bibliografici e Biografici sulla Storia della Geografia in Italia," published on the occasion of the Second International Geographical Congress, Paris, 1875, by the Società Geografica Italiana, Rome, 1875; reference on Pls. 8 and 9 (the second edition, Rome, 1882, does not contain the plates).

[2] A. E. Nordenskiöld: Periplus: An Essay on the Early History of Charts and Sailing Directions, Stockholm, 1897.

K. Kretschmer: Die Entdeckung Amerikas in ihrer Bedeutung für die Geschichte des Weltbildes, 2 vols. (text and atlas), Berlin, 1892; reference on Pl. 4.

[3] A. Magnaghi: Il mappamondo del genovese Angellinus de Dalorto (1325): Contributo alla storia della cartografia mediovale, *Atti del Terzo Congr. Geogr. Italiano, tenuto in Firenze dal 12 al 17 Aprile, 1898*, Florence, 1899, Vol. 2, pp. 506-543.

[4] A. E. Nordenskiöld, *op. cit.*, Pl. 8.

[5] Theobald Fischer: Sammlung mittelalterlicher Welt- und Seekarten italienischen Ursprungs, 1 vol. of text and 17 portfolios containing photographs of maps, Venice, 1886; reference in Portfolio V (Facsimile del Portolano Laurenziano-Gaddiano dell' anno 1351)., Pls. 4 and 5.

[6] Jomard: Les monuments de la Géographie, ou receuil d'anciennes cartes, . . . Paris, [1854-62].

[7] G. Uzielli, *op. cit.*, Pl. 7.

[8] A. E. Nordenskiöld, *op. cit.*, Pl. 15.

[9] P. A. Jaubert (translator): Géographie d'Édrisi, traduite de l'Arabe en Français, 2 vols. (Receuil de Voyages et de Mémoires publié par la Société de Géographie, Vols. 5 and 6), Paris, 1836 and 1840; also later by Joly and Goegi. The Pockocke and Greaves MSS. are in the Bodleian Library, Oxford.

[10] K. Kretschmer, *op. cit.*, atlas, Pl. 5.

[11] E. L. Stevenson: Portolan Charts, *Publ. of the Hispanic Soc. of Amer. No. 82*, New York, 1911.

[12] K. Kretschmer, *op. cit.*, atlas, Pl. 4.

[13] Preserved in the Grand Ducal Library of Weimar. Part showing Antillia never reproduced; writer has photograph, made in Weimar.

out beyond the Portuguese islands across a great expanse of sea; and its name Antillia has exactly or very nearly the sound of Anti-illa or Ante-illa —*illa* being the older Portuguese form of *ilha*, island, and found on many maps. Here we have a perfectly natural genesis and derivation. Why go back instead to the Greek Atlas and the ancient Atlantis tale of submergence?

Moreover, while a drowned land might leave a few jutting peaks above the surface, it would not be represented by a great insular mass like Beccario's and Bianco's Antillia. Nor could any fragment, if preserved, be expected to retain the shape of the entire lost island, so as to afford corroborative evidence, such as some have thought they drew from a comparison between the map island and the description given by Plato.

The hypothesis of the identity of Atlantis and Antillia dates back nearly to the first revival of interest in the map of Bianco, 1436, and has numbered d'Avezac among its adherents, though he did not subscribe to it very confidently. But they have remained a minority. It did not convince Formaleoni,[14] nor Alexander von Humboldt,[15] who devotes an interesting passage of the "Examen Critique" to his positive dissent, nor Nordenskiöld,[16] who states roundly in his "Periplus" that all maps showing Antillia should be classed among maps relating to the New World and proceeds to put his precept into practice.

In view of these facts, it is certainly quite unwarranted to assert that Antillia of the maps represents Atlantis or that Atlantis had anything to do with naming the Antilles.

The name Antillia may be older than the special area and outline with which it was so long associated, for we seem to find it as "Atilie" or "Atilæ" in a corrupt and uncertain Latin inscription on Pizigano's abovementioned map of 1367, so well reproduced by Jomard. A picture, inverted, of a huge statue accompanies it as having been set up on the shore of the island, not shown, to warn navigators against sailing farther west. The location might indicate Corvo,[17] where there was also a tradition of a statue, but one rather inciting than restraining. The item is too frail to lean upon. If this word be not Antillia, the name was as unknown as the great island form before the fifteenth century, so far as present information tells us. If it be Antillia on Pizigano's map, then this name made afterward a mighty migration southwestward to reach the abiding-place of Beccaria's Antillia.

The latter island seems most reasonably explained by three items—the tradition recorded on Behaim's map[18] that an Iberian ship had visited

[14] Vicenzio Formaleoni: Description de deux cartes anciennes tirées de la Bibliothèque de St. Marc à Venise, pp. 91-168 of the same author's "Essai sur la marine ancienne des Vénitiens," trans. by the Chevalier d'Henin, Venice, 1788.

[15] A. von Humboldt: Examen critique de l'histoire de la Géographie du Nouveau Continent, 5 vols Paris, 1836-37; references in Vol. 2, pp. 192 and 211.

[16] *Op. cit.*, p. 177.

[17] A. von Humboldt, *op. cit.*, Vol. 2, p. 325.

[18] E. G. Ravenstein: Martin Behaim: His Life and His Globe, London, 1908.

it in 1414; the inscription on Beccario's 1435 map to the effect that Antillia and her consorts are newly reported islands; and the well-defined scheme of great insular land areas, constituting a remote southwestern archipelago, so confidently repeated on the maps during many years and so unlikely to occur in the first instance to any one who had no actual knowledge of the West Indies.

As to Atlantis, Plato's minute and realistic description may indicate only the literary skill which clothes a tale with verisimilitude; but it is probable that its general drift and catastrophe embody a genuine tradition, and this would most likely have some reality behind it sure to grow enormously in the telling—a growth that might well be stimulated by the need to explain the well-known impediments of the Sargasso Sea.

In fact sudden loss of insular territory has occurred in rather recent times. According to a work on the Azores by a native of Flores,[19] an appreciable slice of that island, two miles long, simply fell off about the middle of the last century and formed temporarily a new island, and also caused a great wave which drowned two people on Corvo, six miles away. This latter island, too, may have had its losses. Though now much the smaller of the two, it is shown as far the larger on the maps of the fourteenth and fifteenth centuries, also as being in shape like a clover-leaf, a form which it does not now present. We cannot say whether this difference is due to some early inaccuracy of report or drawing, slavishly repeated, or whether it records some subsidence of the island or other change reducing its area. Perhaps all these East Atlantic archipelagoes may profitably be investigated with such possibilities in view.

But at present we can only say that neither the maps nor records show any great loss of land and that a vast Atlantis, suddenly sunk, would be unique in human history.

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[19] Borges F. de Henriques: A Trip to the Azores, pp. 14, Houghton & Co., 1867.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

April Meetings. The regular monthly meeting of the American Geographical Society was held on April 24 at the Engineering Societies' Building, 29 West Thirty-ninth Street. President Greenough presided. He submitted the names of 197 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society. Thereupon Mr. Le Roy Jeffers delivered a lecture entitled "Mountaineering in North America." Mr. Jeffers exhibited a large number of views of the most famous mountains, waterfalls, and other scenic features of British Columbia and the West. An inter-monthly meeting was held on April 10, an account of which follows immediately below.

Presentation of the Cullum Geographical Medal to Major-General George W. Goethals. At an inter-monthly meeting of the Society on April 10, at the Engineering Societies' Building, 29 West Thirty-ninth Street, Major-General George W. Goethals was presented with the Cullum Geographical Medal.

President Greenough presided, and in presenting the medal spoke as follows:

"Ladies and Gentlemen, Fellows of the Society:

"It is my agreeable duty, as your representative, to ask the acceptance by our distinguished guest of an enduring memorial of appreciation of his work and genius in the completion of the great undertaking with which his name is irrevocably associated. Honors and praise have deservedly been showered upon him from many quarters, and other speakers have described, far better than I could, the physical difficulties which he has surmounted and which are familiar to you all. I desire in my few remarks to suggest some reflections on what I may term the moral triumph achieved by him in the conduct of his arduous task.

"The conception of an inter-oceanic canal took shape speedily after the Spanish occupation. In the year 1551 the Marquis de Gomara, historian of the Indies, after describing his plan for piercing the Isthmus, memorialized the King as follows: 'There are mountains, but there are also hands; give me the resolve and the task will be accomplished. If determination is not lacking, means will not fail.' Three and one-half centuries had to elapse before these brave words were crystallized into action, but they breathe the spirit which found embodiment in the chief who was destined finally to conduct the enterprise to success, and whom we honor tonight. Never, I believe, has a finer example been offered of fortitude under discouragement, of devotion to duty, and of abnegation of self in directing great affairs. It seemed at times as if both nature and man were in league to enhance his difficulties, but unflinchingly and calmly he devised plans to overcome the forces of the one, and to defeat the designs of the other. Duty and service formed his sole incitement and guide in every action, and it was his rare gift to be able to animate others with his own enthusiasm in the midst of obstacles.

"I do not strain the comparison if I recall that the fame of the Father of his Country rests no less upon his power to inspire the failing ardor of his countrymen than on his ability to lead them in conflict; and that thought of his own advantage was ever forgotten in his devotion to his country. It is a pleasing thought that the attributes of Washington have found a place in the character of his compatriot and namesake, George Washington Goethals, to whom I address your felicitations.

"And now, General, on behalf of the American Geographical Society, I beg to present to you their gold medal, which seeks to record in the brief terms of its inscription your great achievement and its relation to the science to which the Society is devoted. It reads:

TO GEORGE W. GOETHALS
BUILDER OF THE PANAMA CANAL
HE FULFILLED THE ANCIENT DREAM OF GOMARA
OF A HIGHWAY BETWEEN THE ATLANTIC AND THE PACIFIC
AND THEREBY TRANSFORMED FOREVER
THE GEOGRAPHIC RELATIONS OF THE COMMERCIAL WORLD

"May I be permitted, in presenting this emblem, to add that it is accompanied by the personal good wishes of our three thousand Fellows for your long-continued health and prosperity?"

In accepting the medal General Goethals spoke of his high appreciation of the award no less on behalf of the great force of men who helped build the Panama Canal than for himself. He wished to share with all of them an honor which he accepted as their spokesman and representative. There followed a most interesting account of the construction of the canal, fully illustrated with lantern views, which showed the various methods of excavation; the special problems, with particular reference to the great slide; the dams and lock system and the mode of operation; and the new terminal facilities, ports, wharves, dry dock, and breakwaters.

Sir Ernest Shackleton's Visit to New York. The main outline of the story of Lieutenant Sir Ernest Shackleton's last expedition to the Antarctic is familiar to readers of the *Review* (Return of Shackleton from Weddell Sea, Vol. 2, 1916, pp. 54-57, with map; Rescue of the Marooned Men of Shackleton's Weddell Sea Party, *ibid.*, pp. 231-232; Rescue of the Marooned Men of Shackleton's Ross Sea Party, Vol. 3, 1917, pp. 245-246). By those who had the privilege of hearing him in Carnegie Hall on Sunday evening, April 29, no detail of that story will ever be forgotten. Sir Ernest modestly called the account of the expedition a story of failure because the original objects were not achieved; but so long as the race breeds men of courage, so long as loyalty to his pledged word is part of a gentleman's creed, this story of "failure" will stir men's hearts and kindle their deepest enthusiasm. Shackleton told his men, whom he left marooned on Elephant Island, that he would return, and he simply did that, neither stopping at the end of a third failure nor deceiving himself by the specious thought that the men must have died before the fourth relief ship could sail. All were safe; and their faith in his return will be immortalized in history by the command of Frank Wild, who on each clear day ordered: "Boys, roll up your sleeping bags; the 'boss' may come at any moment."

In this, of all times the most perilous for that civilization which it has cost the race such tragic effort to build, it is well to hold before us this latest and in many respects greatest epic of polar exploration and to take heart of the thought that the man who did not count the cost of keeping faith with comrades represents a nation allied with us in rescuing civilization from great peril.

The lecture was given under the joint auspices of the American Geographical Society and the American Museum of Natural History. It was repeated before the Geographical Society of Philadelphia on Tuesday, May 1; at Aeolian Hall, New York, Wednesday, May 2; and had been given a few days previously before the Geographic Society of Chicago. Sir Ernest also made a few informal remarks at the Explorers' Club luncheon at which he was the guest of honor on Sunday, April 29, at the Hotel Majestic, New York. He returns to England presently, where, after two weeks' rest, he will enter the war service. Twenty of his men are already at the front, where one of them was killed on his first day in the trenches.

NORTH AMERICA

The Survey of the Air over North America. A strong movement is under way to develop a survey of the air over North America and the adjoining waters. The objects are to observe and chart the irregularities of air currents, to establish aërological stations for observers not only at the earth's surface but also aloft to ten thousand feet or more, and thereby to safeguard aircraft and the lives of aviators and extend their limits of service both in time of peace and in time of war.

The National Advisory Committee for Aëronautics is fostering the movement and has the support of the Aëro Club of America and many men of high scientific standing. An Aërological Survey might become co-ordinate with the Hydrographic Office, the Coast and Geodetic Survey, and the Geological Survey. The need for better aëronautical charts is apparent to every one who is interested in the progress of flying. The *Review* will shortly publish a series of articles on the construction and use of such charts, with special reference to the development of a standard set of symbols. A bibliography of the subject and a number of illustrations will accompany one of the articles. They will deal with the two chief kinds of aëronautical charts: those designed as mere route charts for long cross-country flights and those on a large scale and showing much detail, which are constructed for intensive work like that required on a fighting front or in a densely populated region where frequent stops, as in mail or passenger service, may be necessary.

The Eradication of Malaria in the United States as a Preparedness Measure. The geography of disease has been a subject of frequent comment in the *Review*. Ward has emphasized this in "The Hygiene of the Zones" (Chapter 7 of his "Climate Con-

sidered Especially in Its Relation to Man," New York, 1908, pp. 178-219). A recent paper of exceptional value was read by F. L. Hoffman at the tenth annual meeting of the Southern Medical Association, November 14, 1916, and is entitled "A Plea and a Plan for the Eradication of Malaria Throughout the Western Hemisphere" (65 pp.; Prudential Insurance Co., Newark, N. J.). Not the least among its good qualities are its copious references to the literature of land drainage, the climatic elements of environments, and well-digested statistics regarding mortality and sanitation.

It is shown that malaria ranks first among the endemic diseases of the South in causing social and economic loss and in its widespread and insidious character. In warm climates especially it produces in the aggregate an enormous amount of sickness and mortality. And though it has been largely stamped out in the North as a result of the general settlement of the land and the drainage of swamps and pools, there are still left important centers of development, as in the Valley of California, where in some otherwise promising localities there is a retarded growth on account of its prevalence. This is a deplorable economic waste in the light of the needs of our rapidly increasing population.

Expeditions and commissions for the study of malaria have been sent to various geographical regions: it suffices to mention the Ross expedition to Sierra Leone, the Taylor expedition to Nigeria, and the investigation of the sanitary conditions at Pará, the Panama Canal Zone, India, Dutch East Indies, and British Malaya. Thoroughgoing these have been and productive of conclusions now requiring transformation into government statutes and works.

In the United States the soil surveys and topographic surveys already made promote field studies of malarial conditions and should be extended more rapidly than in the past to the end that governmental control of primary sanitation laws may become effective. Parts of the South have been mapped in an adequate way, but meteorological conditions require further investigation in spite of their secondary importance. O'Connell's studies deserve special consideration as suggesting unrealized relations between malaria and meteorology.

The proposal is to improve rural sanitation; to construct rural post roads; to carry on demonstration work; to promote drainage plans and stimulate activity in educating the people to a knowledge of the habits of the *Anopheles* mosquito and the proper use of quinine in prevention and cure; to search for natural enemies of mosquitoes; and to accomplish these results by the widest publicity through industrial and corporate organizations, international and national congresses, state and county governments, etc.

The most intensely malarial sections of the United States today are the Yazoo Delta counties of Mississippi, the river counties of Tennessee, southeastern Missouri, Arkansas, and Louisiana. From seven river counties of Missouri the average mortality rate for the period 1911-1914 inclusive was 168.8 per 100,000 population, for Dunkin County as high as 296.7. This is higher than the rate for the corresponding period in Trinidad and Tobago (218.9) and almost as high as that for Venezuela (305.6).

Progress in reducing the prevalence of the disease is most satisfactory. The malarial death rate at Havana has been reduced from 49.0 per 100,000 in 1900-1904 to 2.4 per 100,000 in 1910-1914, or 95.1 per cent! In the Danish West Indies (now the American Virgin Islands) the rate has been lowered 88.8 per cent, in Rio Janeiro, 86.5 per cent, and in Colombo, Ceylon, 84.9 per cent.

The Probable Growing Season for Crops in the United States. William G. Reed, of the Office of Farm Management, U. S. Department of Agriculture, has been investigating the length of the growing season in the United States and has presented a number of new facts which are of practical use to farmers (The Probable Growing Season, *Monthly Weather Rev.*, Sept. 1916). The average number of days without frost is not all that the intelligent farmer needs or wishes to know. He needs information as to the chances of his having a longer or a shorter growing season. Then he can decide whether the risk of his losing his crop is worth taking or not. Mr. Reed has constructed three maps which are an interesting and important extension of our practical knowledge of frost conditions in relation to agriculture (*ibid.*, Pls. 122-124; see also Figs. 3 and 4 in the same author's article on "Weather as a Business Risk in Farming" in the July, 1916, *Geogr. Rev.*). The first map shows the number of days without killing frost for which the chance is about 4 in 5, the chance being computed in the same manner as insurance risks are determined. If losses from frost occur more frequently than once in five years, success in the crops is not likely. A second map shows the dates on which the chance of killing frost falls to 1 in 10, or when the chance that there will be no later spring frost becomes 9 in 10. A third map shows the probable end of the growing season. The dates are those when the chance of safety becomes less than 9 in 10.

R. DEC. WARD.

A Highway along the Pacific Coast. A proposal has recently been made to connect the harbors on the Pacific by means of a highway built along the coast and for which the name of "Balboa Highway" has been suggested (F. W. Harris in *Engineering News* for March 15, 1917, p. 433). The harbors on the Pacific are isolated, especially in the northern sections, because the foothills of the Coast Range usually reach the sea. Evidence as to the need for intercoastal communication, which affords an interesting example of geographic response, is afforded by the practice, followed since pioneer days along the Oregon coast, of running stage lines on the beaches, according to a schedule based on the nautical almanac. The growing importance in recent years of many of these harbors, including Gray's Harbor and Willapa Bay in Washington, Coos Bay in Oregon, and Humboldt Bay in California, strengthens the need of a road which will enable communication to be easily maintained between them.

The construction of this road will mark the beginning of the industrial development of the region. At convenient distances from the harbors lie forests which may be made to yield ample supplies of wood pulp. Hydro-electric power can be generated at low cost and coal is not wanting. From a military standpoint also the road will be of great value, especially in the section between Coos Bay and Eureka, on Humboldt Bay, between which points intercourse along the coast is practically barred by the Siskiyou Mountains.

Anegada, A Near Neighbor of Our New Insular Possessions. Anegada is the northernmost of the Virgin Islands; of ancient notoriety, today it is almost forgotten. At intervals of weeks some boat may arrive from Tortola or Virgin Gorda, and occasionally the inhabitants carry vegetables to market in St. Thomas. The island resources are self-sufficing. The coral-derived soil, irrigated from the curious natural water holes called "wells," is wonderfully productive; cattle thrive on the island flats, and the sea adds to the generous food supply. There is little to disturb the lotus-eating existence of the Anegadan; his sole diversion, indeed, is "a vessel on the reef." Even today this may prove a profitable excitement, but it cannot compare in this respect with the good old times when the harbor of St. Thomas was filled with shipping and before the long arm of the law was wielded so effectively from Tortola. Then the settlers "derived more money from shipwrecks than ever they obtained by growing provision crops and cotton, or by rearing cattle, which, together with the wood of the turpentine tree, they took to St. Thomas and other ports for sale." In the business of "wrecking" Anegada, of course, was not unique; it has been an important economic phase in many another minor West Indian island. But this outermost of the islands, the first sighted on the old route from Spain, enjoyed peculiar advantages from the wrecker's point of view. It is distinguished by its dangerous tides and currents. In two years alone 63 vessels are reported to have been wrecked on its winding reefs. The name of the island—Anegada, the Drowned—suggests another physical peculiarity. With the exception of an elevation of sixty feet in the southeast the island lies so low as to be literally submerged during heavy gales. Circumstances thus combine to make it singularly well adapted for the other nefarious phase of sea traffic that preceded permanent settlement and the age of the wrecker. Of all the buccaneer haunts in the West Indies none is more famous than Anegada, the first and last stronghold of these sea-rovers (Patrick Vaux: A Forgotten West Indian Island, *United Empire*, February, 1917).

EUROPE

A Geographical Interpretation of Berlin. Under the title "Berlin and Its Region" Dr. H. J. Fleure recently presented before the Cities Committee of the (British) Sociological Society a statement of certain fundamental geographical influences operating in the evolution of Berlin as a great national capital (13 pp.; Sherratt & Hughes, London, 1916).

The growth of the German center is in sharp contrast with that of Paris. Paris, city on a hill "around which has blown for centuries the wind of the spirit," has long been the focus of widespread influences, especially from the sunny lands of the Mediterranean (compare the note on "The Geographical Basis of the French Spirit" in the February *Review*, p. 150). Berlin on the contrary is the center of a late-developed, naturally unattractive plain, poor alike in material and spiritual inheritance. The forested swamp of the North German Plain fell without the sphere of Roman influence, bounded effectively by the line of the Rhine-Danube, a line roughly coincident with the southern limits of a frozen January. Even in the Middle Ages the Rhine constituted a definite obstacle to progress eastwards, though a certain penetration into the "tangled valleys" of the Southern Highlands quickened the life of the several small

independent states growing up therein. But, while these small valley centers, making use of the metal and timber resources at their command, were carrying on a profitable trade with the Hanse towns of the Baltic and North Sea shores, the plain itself remained merely a zone of transit. Population concentrated on the seaboard and along the "fall line" which marks the topographic break between the old Southern Highlands and the Northern Plain. The characteristic effect of such a line in the concentration of human occupation is shown on the accompanying map of the German fall-line cities. Of them Leipzig may be taken as a type. Today, under the transformations necessitated by a modern market, it still maintains the great fair that originated there through the favorable location at a meeting point of routes. In medieval days perhaps the greatest interest of the plain gathered about the eastern frontier between Elbe and Oder, held by the Teutonic knights as an outpost of Christendom. When in the seven-

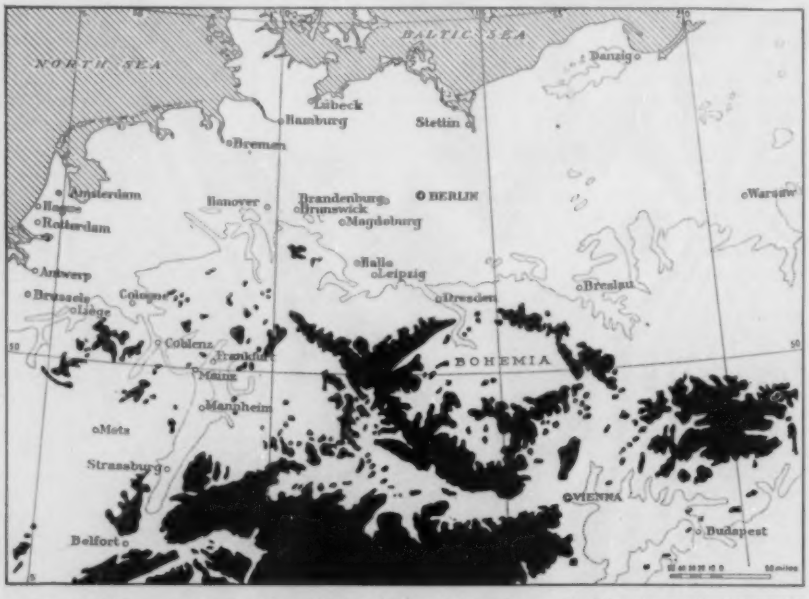

FIG. 1—Outline map showing the relation of cities to the German "fall-line." Scale, 1:10,000,000. (Redrawn from H. J. Fleure's "Berlin and Its Region.")

By "fall-line" is meant the boundary between the uplands and the plain, approximately indicated by the 600-foot contour, here shown as a dotted line. The areas over 1,500 feet high are shown in black.

teenth century the sea trade of the Baltic declined and the commercial bonds across the plain weakened and Europe was engulfed in the Thirty Years' War this military character of the plain occupation was strengthened.

Now also began the development of east-and-west communications, a movement helped by the east-west grain of the surface, dependent on the lines of morainic hills. From Holland at the western edge of the plain came important influences working in a variety of ways, from the introduction of personal factors—notably the alliance of the Electorate of Brandenburg with the House of Orange—to Dutch help in the construction of canals. To the latter is directly due the rise of Berlin: the city is essentially a route center of the plain. As a focus of national life, however, Berlin is seriously handicapped by its extreme poverty of that inheritance from the past wherein the French capital is so rich. Such roots of national unity are indeed much more abundant in the fall-line cities, but certain physical circumstances have militated against the establishment of a fall-line capital. Amongst them may be noted the existence of the "unassimilated" Bohemian block that has diverted to itself and to the Vienna basin much of the interest of the South German towns. Again, the seaboard fails to provide a focus such as the English plain possesses in London. Hamburg at one extremity has developed rather under state influence from Berlin than by a natural evolution from

fisheries and coastwise trade. National control centering in the plain was thus confronted with the problem of building up a national unity upon scant bases. This it has been sought to accomplish by a policy of spiritual isolation. Political barriers have been emphasized and the new national conscience has been cut apart from the humanizing influences of exterior contact, a policy easily carried out in a region where state control has been essential to material success.

Switzerland, and Europe's System of Navigable Inland Waterways. Because of its mountain location, Switzerland appears at first sight obliged to lie outside of the system of European inland water routes. But this isolation is costly, and the stimulus to reduce the cost of foreign merchandise has led to plans for the expansion, mainly toward the Mediterranean, of Switzerland's existing water connection with the sea. In an article entitled "La position géographique de la Suisse: Étude de géographie politique" (*Ann. de Géogr.*, Nov. 15, 1916, pp. 413-429) Professor Henri Hauser of the University of Dijon develops this theme and shows how dependent economically Switzerland is on the Rhine route: a ton of wheat routed through Rotterdam to Bern costs only 21.80 francs, whereas by way of Genoa it costs 25.10 francs.

Among these plans is the proposal to connect the Rhone with the Rhine by way of Swiss territory—the existing canal between the two river systems, from Strassburg via the Belfort depression to the Doubs River, lying wholly within German and French jurisdiction—and to make of Geneva a collecting center of merchandise coming from Mediterranean harbors. The city has the example of Basel, which has become the head of the whole Rhine channel from Rotterdam up. The route of the proposed waterway is as follows: up the Rhine to the mouth of the Aar (this would involve removal of the obstructions to navigation above Basel, between Rheinfelden and the Aar), up the Aar, through the Lakes of Biel and Neuchatel, and via the disused Canal d'Entreroche into the Lake of Geneva. Proceeding from Geneva on French territory, the "Perte du Rhône" below that city, where the river partly disappears under limestone rocks, would have to be circumvented; then the whole course of the Rhone would be available unobstructed to the Mediterranean. Here, on the Berre lagoon, which has recently been connected by a tunneled canal with Marseilles (see note in *Geogr. Rev.*, Vol. 1, 1916, p. 459) a harbor might be established especially for Swiss import trade, somewhat as Cette is now, due to the circumstances created by the war, fulfilling that function.

A radical change in the economic life of the country would follow the creation of this waterway. At present Switzerland is dependent on Westphalian coal. The rapid development of its industries has outgrown the supply of power from hydraulic plants. Likewise for the iron which it needs Switzerland has to rely largely on Germany. These facts explain why the Teutonic empires have exerted such influence on Switzerland during the war. Indeed, one-third of all Swiss imports are derived from Germany while one-fifth of its exports are sent to that country. The construction of a waterway with an outlet to the Mediterranean, offsetting the present tendency to gravitate toward the North Sea, would therefore strengthen Switzerland's political stability as a European nation, while it would enable its citizens to buy more cheaply from abroad.

Use of a Relief Model in Warfare. The value of relief models as a means of visualizing topography and geographical relations in general has recently been demonstrated on the western front. A press despatch from London dated April 15 (*New York Times*, April 16) relates that, in preparation for the recent offensive in the neighborhood of Lens, a British officer had prepared, from aërial photographs and all available information, a large-scale plaster model of Vimy Ridge which indicated every natural feature, the trenches, railways, defenses, roads and streams, and even the mine craters. The familiarity with the terrain gained from a study of the model was of immense advantage in the subsequent successful assault on this important key.

Climate and the Fall of Rome. Modern progress in science is constantly providing new and more logical interpretations of the decline of the Roman Empire. One of these, by Professor Simkhovitch, giving soil impoverishment as the cause, was noticed in the November *Review* (Vol. 2, p. 376). A recent article by Dr. Ellsworth Huntington (Climatic Change and Agricultural Exhaustion as Elements in the Fall of Rome, *Harvard Univ. Quart. Journ. of Economics*, February, 1917) takes up climate as one of the factors to which the decline of Roman power was due. Referring to previous studies as outlined in his "Civilization and Climate," Dr. Huntington believes that the climatic record indicated by the thickness of the rings in the big trees of California is equally valid for Italy. Modern research has at any rate established the correlation of atmospheric pressure or temperature in widely separated parts of the earth, and it

seems safe to assume that the growth of sequoias is an index of the conditions affecting rainfall in far-away Italy for any considerable period of time.

Applying in a generalized manner the curve of the big trees to Italy, Dr. Huntington finds that from 450 to 250 B. C. the climate of that country was favorable to human activity, but that a change for the worse ensued in the next half century and persisted during the second century, though not without indications of improvement. Thence to the beginning of the third century of our era a period of ups and downs intervened, after which aridity set in which lasted until the fall of the empire. This was followed by better conditions, but the seventh and eighth centuries seem to have been very unfavorable. In comparing these periods of climatic fluctuations with the agricultural changes outlined by Professor Simkhovitch, Dr. Huntington finds that the agricultural decline coincides with arid periods.

Turning to another factor, malaria is considered. The biological decline of the Romans has been attributed by observers of standing to the prevalence of this disease. Dr. Huntington shows that stagnant pools become numerous with increasing aridity. As long as precipitation is sufficiently abundant, springs flow freely in their channels. With slackened activity due to shortage of water, they become loaded with mud and gravel, their channels are either filled or directed into new courses, and shallow bodies of still water are created.

Dr. Huntington is thus of the opinion that the wane of Rome's power is not attributable alone to agricultural exhaustion, as Professor Simkhovitch suggests. He regards the decline of agriculture as one of the manifestations of climatic changes, malaria and its biological effects being considered as other results of the same general cause.

AFRICA

Physical Geography of Spanish Morocco. A summary of the results of the expedition to Spanish Morocco sent out in 1913 by the Real Sociedad Española de Historia Natural and the Ministerio de Estado is given by Professor J. Dantín Cereceda in a recent article (La Zone Espagnole du Maroc, *Annal. de Géogr.*, Sept. 15, 1916). Only the Yebala (French spelling, Djebala) district, extending from the Mediterranean to the Atlantic, of which the towns of Tetuan, Ceuta, Tangier, and Larache are the foci, and the lower valley of the Lucus, a short river draining into the Atlantic, were visited. This district forms the western part of Spanish Morocco, which is practically coextensive with the Rif Range, a chain which forms the direct continuation across the Strait of Gibraltar of the Betic Cordillera, of which the Sierra Nevada is the most conspicuous member. (The two ranges form a letter *U* lying on its right side, with the Strait of Gibraltar on the middle of its curved portion.) The Rif Range is distinct from the Atlas ranges, from which it is separated by the depression of the Wadi Sebu, opening funnel-shaped to the Atlantic. The lower valley of the Lucus, above mentioned, is a similar depression on a smaller scale, lying to the north of the Sebu.

The climate of the district, and consequently the vegetation, is of the Mediterranean type. Three plant associations may be distinguished: the evergreen forest, in which the wild olive is the characteristic tree; the *maquis*, or dense thicket growth, a xerophytic association which best reflects the climate of the region and is characterized by the dwarf palm; and a steppe region, surprisingly rich in flowering forms in springtime, when it is frequented by the Moors with their flocks.

The most fertile part of Spanish Morocco is the zone which lies between the coastal dunes on the Atlantic and the plateaus forming the southwestern border of the Rif Range. Here occur the *tirs*, or black soils, akin to the famous *chernozicm* of southern Russia. Professor Dantín Cereceda departs from the usually accepted beliefs regarding the origin of these soils and considers them as having been formed during an earlier, moister climate (see also the note on "The Southwesternmost Black Soils of Europe" in the December, 1916, *Review*, pp. 468-469, where reference is made to the author's paper on this topic).

The Arable Lands of Egypt and Their Utilization. The great reclamation works in the Nile Valley have increased the extent of arable land in Egypt by 26 per cent between 1898 and 1913, namely, to a total of about 13,000 square miles (33,402 square kilometers), according to a Cairo letter to *L'Économiste Français* for January 8, 1913. Almost a third of this additional surface (11,218 square kilometers) has not yet been cultivated, chiefly because the fellah farmers and the large land owners have in recent years applied themselves to intensive farming, a procedure largely made possible because of the greater productivity of the soil resulting from the reclamation works. Whereas in 1898 34.5 per cent of the farm lands had been made

to yield more than one crop per year, in 1913 this figure had risen to 46 per cent. Egypt's reserves of soil are therefore abundant and they bear promise of wealth in store for its inhabitants.

According to statistics in the same article, future development will occur mainly in Lower Egypt, where vast stretches of marshes have been reclaimed. In Upper Egypt the increase in arable land, although relatively greater, does not amount to so large an area. On the other hand the lands yielding more than one yearly crop have nearly doubled in Upper Egypt, whereas in Lower Egypt they have increased by only one-fifth. This is due to the introduction of perennial irrigation in place of the former annual operation at the time of the Nile flood.

Development of a Coalfield in Southern Nigeria. The survey of the mineral resources of Southern Nigeria undertaken by the Imperial Institute led to the discovery in 1909 of the Udi-Okwoga coalfield (*Bull. Imperial Inst.*, Vol. 14, 1916, pp. 369-378). The coalfield, named from villages at its extreme ends, is situated on the threshold plateau of Upper Guinea, which lies back of the coastal lowland, and occupies some 1,800 square miles northeast of Asaba on the lower Niger, where extensive beds of lignite are also known to occur. The coal is of Cretaceous age and of sub-bituminous quality. In the hands of the Public Works Department development has made good progress since the completion of the railroad from Port Harcourt to Udi, the southern limit of the district (see note on "New Port and Railroad for Nigeria" in the *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, p. 205). Exploitation is facilitated by a local labor supply above the average for a primitive country. On the other hand the local timber supply is already almost exhausted, and imports now come from Lagos.

ASIA

Typhoon Precipitation in China. A study of the distribution of precipitation in China during the typhoons of the summer of 1911 has been made by Co-Ching Chu, a graduate student of meteorology in Harvard University (*Monthly Weather Rev.*, August, 1916). The most important conclusions reached are (1) that the distribution of rainfall in tropical storms is uniform when compared with that in extra-tropical cyclones; (2) that the heaviest rainfall usually occurs on that part of the coast where the storm passes from sea to land; (3) that the velocity of the typhoons here investigated did not decrease as they passed from sea to land; and (4) that the heaviest precipitation usually occurred along the track. In cases, however, where the storm went far inland, this rule did not hold. In this respect, the behavior of these tropical cyclones resembled that of extra-tropical cyclones. William G. Reed, in his study of the cyclonic distribution of rainfall in the United States (*Monthly Weather Rev.*, Vol. 39, 1911, pp. 1609-1615), found that the area of heaviest precipitation usually occurred on the side nearest a considerable source of moisture. R. DEC. WARD.

Proposed American Railway in Southern China. The construction with American funds of a railway is projected to tap the rich Kwangsi province in southern China, according to information in the November, 1916, issue of the *Far Eastern Review* (pp. 217-224). The line will extend from Hengchow in Hunan province to the seaport of Yamchow on the Gulf of Tonkin. At Hengchow it will connect with the great north-and-south trunk line through China when it is completed south to Canton beyond its present stretch, Pekin-Hankow.

At present rivers provide the only lines of travel in Kwangsi. The province is rich in natural resources. Its fertile valleys have the reputation of being the granary of Kwangtung. A part of the agricultural products, consisting of cereals, indigo, groundnuts, tobacco, cotton, aniseed, camphor and olives, are transported down the waterways to Canton. Its mineral wealth is extensive, both precious and base metals being mined by the natives. Being relatively sparsely populated—its 5,140,000 people are distributed over 77,200 square miles—the province needs railroads badly.

When the line is completed, the present network of Chinese railways will have been extended to the southwestern districts of the country. This part of China has been administered with difficulty from Pekin owing to the lack of communications. The railroad will develop new life. It will furthermore be a connecting link between the French lines of Indo-China and the Chinese railways. As contemplated, the road will benefit Canton greatly.

POLAR REGIONS

Coal Mining Farthest North. Coal mining carried on in Spitzbergen, in nearly 80° north latitude, claims the distinction of being the most northerly of the world's

organized industries (*Commerce Repts.*, Sept. 8, 1915, and Jan. 7 and Oct. 23, 1916). Its development is receiving much attention, particularly from Norwegians, although American capital has also been extensively invested. The deposits, even in the present state of incomplete investigation, are known to be vast. It is said that the two principal beds outcropping in the fiords between Advent Bay and Green Harbor are estimated to contain over a billion tons. The coal is easily worked by lateral shafts driven into the hillsides a short distance from the shore. *Commerce Reports* for October 23, 1916, states that the Norwegian Spitzbergen syndicate had shipped more than 15,000 tons of coal to Norway since mid-August. The shipments go to Tromsö, 400 miles distant from Advent Bay.

In many respects the industry is conducted under unique conditions. No pumping is necessary in the mines, for temperatures are always below freezing point. Dust is absent, and consequently no danger of explosions is to be apprehended. Shipment is limited to the summer months, but compensation is found in the continuous light of the summer days.

Politically affairs are no less singular. Spitzbergen truly is a No Man's Land. The convention of European Powers that met in Christiania in 1914 to discuss the status of the islands adjourned without conclusion, and further progress is of course closed pending the duration of the war. So the country remains an inhabited land without government and without laws.

GEOGRAPHICAL NEWS

First Annual Meeting of the Ecological Society of America. The Ecological Society of America, whose organization was noticed in these pages (*Geogr. Rev.*, Vol. 1, 1916, p. 224), held its first annual meeting at Barnard College, New York, on December 27, 28, and 29, 1916, under the presidency of Dr. V. E. Shelford of the University of Illinois. The scientific program comprised the reading of forty-two papers and the delivery of two symposiums. The activities of the society are partially centered in investigative committees, three of which were appointed during 1916. The Committee on Climatic Conditions, of which Dr. Burton E. Livingston is chairman, held a symposium embodying the suggestions of its members as to fruitful fields and methods of investigation of climatic conditions as related to the activities of organisms. The papers read in this symposium were as follows:

Ellsworth Huntington: Climatic Optima for Human Activities; A. D. Hopkins: Latitude, Longitude, and Altitude as Factors Affecting Insect Life; D. T. MacDougal: Physiological Aspects of the Influence of Light on Organisms; V. E. Shelford: Evaporation as a Climatic Factor Affecting Animals; B. E. Livingston: The Use of Organisms as Instruments for Comparing Effective Environmental Conditions.

The Committee on Soil Temperature, of which Dr. Forrest Shreve is chairman, also organized a symposium on the importance of soil temperature in various lines of ecological work. The papers read in this were as follows: Raphael Zon: Soil Temperatures as a Factor in Forestry; Alfred E. Cameron: Relation of Soil Insects to Climatic Conditions; George P. Burns: The Effect of Natural and Artificial Shade on Soil Temperatures at Different Depths; C. C. Hamilton: The Importance of Soil Temperatures to Insects, As Indicated by Their Behavior; Forrest Shreve: The Projected Soil-Temperature Survey of the United States and Canada.

The Committee on Fresh-water Fish and Fisheries, of which Prof. A. S. Pearse is chairman, was appointed late in the year and is still under organization.

Three field trips were carried out by the society during 1916, one to the Dismal Swamp of Virginia, under the leadership of Prof. J. W. Harshberger; one to the dunes of Lake Michigan and the adjacent region, under the lead of Dr. H. C. Cowles and Dr. V. E. Shelford; and one to the Cuyamaca Mountains and Imperial Valley, California, under the guidance of Mr. Frank Stephens.

The officers elected at New York for the ensuing year are: President, Dr. Ellsworth Huntington; Vice-President, Dr. J. W. Harshberger; Secretary-Treasurer, Dr. Forrest Shreve.

PERSONAL

MR. WILLIAM H. BABCOCK of Washington, D. C., a student of the history of early cartography, from whom a contribution on the problem of Atlantis is printed in the present number, was in April elected president of the Anthropological Society of Washington.

DR. W. H. EMIG of the University of Pittsburgh gave a lecture on "The Plant

Geography of the Arbuckle Mountains, Oklahoma," before the Botanical Society of Western Pennsylvania on February 14.

DR. CHARLES R. FETTKE of the Carnegie Institute of Technology gave an illustrated lecture on "Porto Rico: Its Geology, Natural Resources, and Inhabitants" before the section of biology and geology of the Pittsburgh Academy of Science and Art on March 20.

MISS ADELAIDE R. HASSE, chief of the economics division of the New York Public Library, will give a course of thirty lectures on United States public documents at the summer session of Columbia University from July 9 to August 17. The lectures of geographical interest deal with the following subjects: History of the U. S. Weather Service, July 10; M. F. Maury, July 12; History of the U. S. Coast and Geodetic Survey, July 13; D. D. Owen, July 17; U. S. Geological Surveys, July 18; Francis A. Walker, August 2; N. S. Shaler, August 7; U. S. Road Service, August 8; U. S. Interstate Commerce Commission, August 13.

The plan of the course is to acquaint the student with the personality and accomplishment of some of our great pioneers in economic and scientific government research and with the origin and development of the government bureaus in which these pioneers labored. Miss Hasse is best known to geographers by her helpful bibliography of government exploring expeditions (The Reports of Explorations Printed in the Documents of the United States Government, 90 pp., Office of Superintendent of Documents, Washington, 1899).

PROFESSOR A. J. HENRY of the U. S. Weather Bureau gave a lecture before the Geographic Society of Chicago on April 27 on "Rivers and Floods of the United States."

DR. ELLSWORTH HUNTINGTON returns to Yale University at the beginning of the next academic year to occupy the position of Research Associate in Geography, "research associate" being a new professorial rank established at Yale which is to be occupied by men who do little or no teaching. He intends to reside in New Haven and to give possibly one graduate course.

DR. O. E. JENNINGS of the Carnegie Museum and University of Pittsburgh gave an illustrated lecture on the "Botany of the State of Washington" before the section of biology and geology of the Pittsburgh Academy of Science and Art on February 6. Dr. Jennings is giving a course on ecology and plant geography at the University of Pittsburgh to a class of graduate students.

MR. A. K. LOBECK of Columbia University read a paper before the New York Academy of Sciences on April 16 entitled "The Physiography of Porto Rico."

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

General

STEVENS, W. E. **The organization of the British fur trade, 1760-1800.** *Mississippi Valley Hist. Rev.*, Vol. 3, 1916, No. 2, pp. 172-202.

The history of the Great Lakes region, the upper Mississippi Valley, and the Northwest during the eighteenth and the early part of the nineteenth century is to a great degree the history of the fur trade. Three periods are recognized: a French phase which came to an end when the English, after the capitulation of Montreal in 1760, took military possession of Canada; an English phase which began to yield shortly after the close of the war of 1812; and an American phase which began under the Astor company and gradually waned before the march of white settlers. The need of organization of this trade during the second period, with which the present paper deals, arose from the competition which inevitably follows the establishment of a successful line of business. The old French territorial monopolies with their exclusive trade rights had to give way when the English found means of carrying goods into the heart of the fur district through the Mohawk Valley at a low rate and were thus able to offer their goods in barter at a very much cheaper rate than the French. As competition increased the independent fur trader, who came and went as he chose, was forced to become a member of a system. It was necessary for him to know the condition of the London fur market because competition was cutting down the margin of profit. During the forty years of British sway one can follow the steps of the fur trade as it changes from a feudal type of monopoly to the monopoly of the present, the combination of many individual interests. ROBERT M. BROWN.

—— ***International boundary from the Gulf of Georgia to the northwesternmost point of the Lake of the Woods.*** Surveyed under the direction of: for the United States, O. H. Tittmann, Superintendent, Coast and Geodetic Survey, [and] C. D. Walcott, Director, U. S. Geological Survey; for His Britannic Majesty, W. F. King, Chief Astronomer of the Dominion of Canada. 1:62,500. Sheets Nos. 1-19. [State Dept.], Washington, 1913.

These nineteen sheets comprise only the western third of the forty-ninth parallel boundary between Canada and the United States, i. e., the section west of the summit of the Rocky Mountains (114° W.). The complete survey will comprise 59 sheets. The field work on the present sheets was done in 1901-07, mainly by topographers of the U. S. Geological Survey (by which bureau the maps are engraved and printed) and of the Topographical Surveys Branch of the Canadian Department of the Interior. This survey replaces the old survey of 1857-61 (see the article by Dr. Klotz in the present number and the index map of both series on p. 384). The re-survey of the remaining two-thirds of the boundary is being carried on at present; when published, its maps will replace the 24 sheets, 1:126,720, of the survey of 1872-76. On the present sheets relief is shown in brown contours (interval, 100 feet), drainage in blue, culture and names in black, and woods in green symbols—all in the U. S. Geological Survey's best manner.

CANADA

General

HEATON, ERNEST. **Heaton's annual: The commercial handbook of Canada and Board of Trades register, twelfth year, 1916.** 506 pp. Ontario, 1916. $1.00. 7½ x 5.

LEAVITT, CLYDE, C. D. HOWE, AND J. H. WHITE, comps. **Forest protection in Canada, 1913-1914.** xiv and 317 pp.; maps, diagrs. ills., index. Commission of Conservation, Toronto, 1915. [Includes a section by R. E. Benedict on the forest regions of

British Columbia, with colored map, 1:1,300,000, and one by J. H. White on forest conditions in various parts of the Dominion.]

—— **Levelling operations, Report on, from their inauguration in year 1908 to October 31st, 1914, with a summary of the results.** 364 pp.; map, ills., index. Dept. of the Interior, Ottawa, 1916.

MacKay, A. H. **Bibliography of Canadian botany for the year 1914.** *Trans. Roy. Soc. of Canada*, Ser. 3, Vol. 9, 1915-16, pp. 251-261.

Malcolm, Wyatt. **Bibliography of Canadian geology for the year 1914.** *Trans. Roy. Soc. of Canada*, Ser. 3, Vol. 9, 1915-16, pp. 279-305.

Patterson, H. J. **Upper air investigation in Canada. Part 1: Observations by registering balloons.** 127 pp.; diagrs., ills. *Meteorol. Service of Canada* [*Publ.*] *51.* Toronto, 1915.

Porter, J. B., R. J. Durley, T. C. Denis, and Edgar Stansfield. **Recherches sur les charbons du Canada au point de vue de leurs qualités économiques.** Maps, diagrs., ills., indexes. Vol. I: xiv and 275 pp.; Vol. II: xiii and 204 pp.; Vol. III: 172 pp.; Vol. IV: iv and 424 pp. Division des Mines, Ottawa, 1914.

Prince, E. E. **The herring fishery of Canada: An account of recent scientific researches on the Atlantic coast.** *Proc. at a Meeting of the Committee on Fisheries, Game, and Fur-bearing Animals held Nov. 1 and 2, 1915*, pp. 37-46. Commission of Conservation, Toronto, 1916.

Prince, E. E. **Unutilized fisheries resources of Canada.** Diagrs., ills. *Proc. at a Meeting of the Committee on Fisheries, Game, and Fur-bearing Animals held Nov. 1 and 2, 1915*, pp. 47-64. Commission of Conservation, Toronto, 1916.

Reid, F. B. **Precise levelling.** Map. *Publs. Dominion Observatory*, Vol. 3, 1916, No. 6, pp. 139-217. Dept. of the Interior, Ottawa.

Reinecke, L. **Road material surveys in 1914.** xv and 244 pp.; maps, diagrs., ills., index, bibliogr. *Geol. Survey of Canada Memoir 85: Geol. Series No. 71.* Ottawa, 1916.

Stupart, Frederic. **Monthly record of meteorological observations in the Dominion of Canada, and the colonies of Bermuda and Newfoundland, 1916: (1) March, (2) April, (3) May, (4) June.** 68 pp., and maps, in each. Meteorol. Service of Canada, Toronto, 1916.

Stupart, R. F. **Monthly record of meteorological observations in the Dominion of Canada, and the colonies of Bermuda and Newfoundland. Jan., 1916.** 75 pp. Dept. of Marine and Fisheries, Toronto, 1916.

Stupart, R. F. **Monthly weather Review: October, 1915.** (Vol. 39, No. 10). Pp. 210-233; map. Meteorol. Service of Canada, Toronto.

Stupart, R. F. **Report of the Meteorological Service of Canada for the year ended December 31, 1913.** xv and 605 pp.; diagrs. Meteorol. Service of Canada, Toronto, 1916.

Stupart, R. W. [i. e. R. F.], and R. W. Mills. **Meteorology in relation to agriculture in Canada.** *Monthly Bull. of Agric. Intelligence and Plant Diseases*, Vol. 7, 1916, No. 2, pp. 177-179. Internatl. Inst. of Agric., Rome.

Sulte, Benjamin. **L'histoire écrite du Canada avant 1672.** *Bull. de la Soc. de Géogr. de Québec*, Vol. 10, 1916, No. 3, pp. 131-133. [A short bibliography.]

Tyrrell, J. B. **Pre-Cambrian goldfields of central Canada.** Diagr., ills. *Trans. Roy. Soc. of Canada*, Ser. 3, Vol. 9, 1915-16, pp. 89-118.

Walker, E. M. **Bibliography of Canadian zoology for the year 1914.** *Trans. Roy. Soc. of Canada*, Ser. 3, Vol. 9, 1915-16, pp. 307-318.

Waugh, F. W. **Iroquois foods and food preparation.** xii and 235 pp.; ills., bibliogr. *Geol. Survey of Canada Memoir 86: Anthropol. Series No. 12.* Ottawa, 1916. ["One of the outstanding features of Iroquois material culture was their aptitude for agriculture." A discussion of the methods employed and the customs involved forms the first part of the report.]

White, James. **Dictionary of altitudes in the Dominion of Canada (second edition).** xii and 251 pp. Commission of Conservation, Ottawa, 1916. [New edition, greatly enlarged, of the earlier (1903) valuable compendium by the same author. Like it, it is supplementary to a volume entitled "Altitudes in the Dominion of Canada" (see below) in which the elevations are grouped along main lines of communication or in other regional sequence, while in the present volume they are arranged alphabetically

within each province or territory. Unlike the first edition, it is not accompanied by a relief map of North America.]

WHITE, JAMES, assisted by G. H. FERGUSON. **Altitudes in the Dominion of Canada (second edition).** xxiv and 603 pp.; maps, diagrs., index. Commission of Conservation, Ottawa, 1915.

WILLIAMSON, F. H. H. **Game preservation in Dominion parks.** Ills. *Proc. at a Meeting of the Committee on Fisheries, Game, and Fur-bearing Animals held Nov. 1 and 2, 1915*, pp. 125-140. Toronto, 1916.

Alberta, Saskatchewan, Manitoba

ALCOCK, F. J. **Lower Churchill River region, Manitoba.** *Summary Rept. Geol. Survey of Canada for 1915*, pp. 133-136. Ottawa, 1916. [See also the author's article on the Churchill River in the December *Review*.]

ALLAN, J. A. **Simpson Pass to Kananaskis, Rocky Mountains Park, Alberta.** Bibliogr. *Summary Rept. Geol. Survey of Canada for 1915*, pp. 100-102. Ottawa, 1916.

—— **Athabaska River country, The.** 35 pp.; map, ills. Railway Lands Branch, Dept. of the Interior, [Ottawa], 1916. [Revised edition of portions of "The Unexploited West" compiled by E. J. Chambers.]

AULD, F. H. **Eighth annual report of the Secretary of Statistics, 1914.** 60 pp.; map, bibliogr. index. Dept. of Agric., Province of Saskatchewan, Regina, 1915. [Includes crop statistics and meteorological data.]

BRUCE, E. L. **Amisk-Athapapuskow lake area, northern Saskatchewan and northern Manitoba.** *Summary Rept. Geol. Survey of Canada for 1915*, pp. 126-130. Ottawa, 1916.

DELAND, C. E. **The Verendrye explorations and discoveries.** Maps, ills. *South Dakota Hist. Colls.*, Vol. 7, 1914, pp. 99-222. State Dept. of History, Pierre, S. D.

DOWLING, D. B. **The formation of the Great Plains of northwestern Canada.** *Ottawa Naturalist*, Vol. 30, 1916, No. 1, pp. 11-14.

DOWLING, D. B. **Water supply, southeastern Alberta.** Map, diagr., bibliogr. *Summary Rept. Geol. Survey of Canada for 1915*, pp. 102-112. Ottawa, 1916.

DRAKE, E. F., AND F. H. PETERS. **Reports on irrigation for the year 1915.** 22 pp.; index. *Ann. Rept., Dept. of the Interior, 1915*, Part. 7. Ottawa, 1916.

GWILLIM, J. C. **Notes of a northwestern trail.** *Queen's Quart.*, Vol. 23, 1915, No. 1, pp. 9-15. Kingston.

—— **Irrigation surveys and inspections, 1915, Report on.** 72 pp.; maps, diagrs., ills. Irrigation Branch, Dept. of the Interior, Ottawa, 1916. [Alberta.]

MCGRATH, P. T. **Progress of the Hudson Bay Railroad.** Map. *Amer. Review of Reviews*, Vol. 54, 1916, No. 5, pp. 538-541.

MCINNESS, WILLIAM. **Les bassins des rivières Nelson et Churchill.** *Bull. de la Soc. de Géogr. de Québec*, Vol. 10, 1916, No. 4, pp. 209-213.

—— **Manitoba, Saskatchewan and Northern and Southern Alberta, Supplement to homestead maps of, containing synopsis of regulations governing the granting of homesteads, purchased homesteads, pre-emptions, mineral rights, grazing leases and timber berths, also statistical information relating to western Canada, 1916.** 13 pp.; diagrs. Railway Lands Branch, Dept. of the Interior, Ottawa.

MARTIN, CHESTER. **The Hudson's Bay Company's monopoly of the fur trade at the Red River Settlement.** *Proc. Mississippi Valley Hist. Assoc. for the Year 1913-14* (Vol. 7), pp. 254-265. Torch Press, Cedar Rapids, Ia., 1914.

—— **Peace River country, The.** 47 pp.; map, ills. Dept. of the Interior, [Ottawa], 1916.

RINDSFOOS, C. S. **A river of mud.** *Scientific American*, Vol. 114, 1916, No. 22 (May 27), p. 553. [Note on an occurrence at the head of Rock Creek in the Canadian Rockies determined by sextant as located in 53° 29′ N. and 118° 35′ W., probably identical with Miss Jobe's "Rock Slide Creek"; cf. map facing p. 494, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915.]

RYDER, F. M. **Canada: Prairie Provinces.** 14 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 23c. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

SAUDER, P. M., G. H. WHYTE, AND G. R. ELLIOTT. **Report of progress of stream measurements (hydrometric surveys) for the calendar year 1914.** 508 pp.; diagrs., ills., index. Irrigation Branch, Dept. of the Interior, Ottawa, 1915.

STEWART, J. S. **The disturbed belt of southwestern Alberta.** Bibliogr. *Summary Rept. Geol. Survey of Canada for 1915*, pp. 112-120. Ottawa, 1916.

—— **Survey Branch of the Department of Lands, Province of British Columbia, Report of the, for the year ending December 31, 1915.** pp. 53-170. Victoria, B. C., 1916. [Pagination from the *Rept. of the Minister of Lands, 1915.*]

WALLACE, R. C. **The history of the salt industry in western Canada.** *Proc. Mississippi Valley Hist. Assoc. for the Year 1913-14* (Vol. 7), pp. 277-285. Torch Press, Cedar Rapids, Ia., 1914.

—— **Western Canada Irrigation Association, Report of the proceedings of the Ninth Annual Convention of the, held at Bassano, Alberta, November 23, 24, and 25, 1915.** 249 pp.; ills. Irrigation Branch, Dept. of the Interior, Ottawa, 1916.

—— ***Alberta, Cereal map of, showing acreage under crop in each township in wheat, barley, and flax.*** 3d ed. 1:792,000. Railway Lands Branch, Dept. of the Interior, Ottawa, 1914.

—— ***Alberta, Northern—Southern—showing disposition of lands . . . corrected to Jan. 1, 1916.*** 1:792,000. Railway Lands Branch, Dept. of the Interior, Ottawa, 1916.

—— ***Alberta, Province of; Grande Prairie, Peace River, and Grouard land districts. Showing number of quarter sections in each township available for homestead entry.*** 1 in. to 35 mi. (1:2,217,600). Railway Lands Branch, Dept. of Interior, Ottawa, 1916.

—— (1) ***Birch Hills,*** (2) ***Blackfoot,*** (3) ***Simonette, Alberta,*** (4) ***Limestone River,*** (5) ***Riding Mountain, Manitoba, sheets.*** [***Sectional map of Canada, Nos. 565, 115, 362, 524, 121.***] 1:190,080. Topographical Surveys Branch, Dept. of the Interior, Ottawa, 1915.

—— (1) ***Heart River,*** (2) ***Sullivan Lake,*** (3) ***Victoria, Alberta, sheets.*** [***Sectional map of Canada, Nos. 513, 216, 365.***] 1:380,160. Topographical Surveys Branch, Dept. of the Interior, Ottawa, 1914, 1913, 1912.

—— ***Manitoba, Map showing disposition of lands.*** Corrected to Jan. 1, 1916. 1 in. to 12.5 mi. (1:792,000). Dept. of Interior, Railway Lands Branch, Ottawa, 1916.

—— ***Manitoba, Saskatchewan, and Alberta, Map showing branches of chartered banks in.*** 2d ed. 1:584,000. Railway Lands Branch, Dept. of the Interior, Ottawa, 1914.

—— (1) ***Pasquia,*** (2) ***Qu'appelle, Saskatchewan, sheets.*** [***Sectional map of Canada, Nos. 270, 120.***] 1:190,080. Topographical Surveys Branch, Dept. of the Interior, Ottawa, 1915.

—— ***Regina, Saskatchewan, sheet.*** [***Sectional map of Canada, No. 119.***] 1:380,160. Topographical Surveys Branch, Dept. of the Interior, Ottawa, 1915.

—— ***Saskatchewan, Map showing disposition of lands.*** Corrected to Jan. 1, 1916. 1 in. to 12.5 mi. (1:792,000). Railway Lands Branch, Dept. of Interior, Ottawa, 1916.

UNITED STATES

South Atlantic States

HARPER, R. M. **Geography and vegetation of northern Florida.** Introduction by E. H. Sellards. Map, ills., index, bibliogr. *Sixth Ann. Rept. of the Florida State Geol. Survey*, pp. 163-437. Tallahassee, 1914.

The region treated in this report embraces that part of Florida which lies north of the southern boundaries of Lafayette, Alachua, Putnam, and St. Johns Counties, an area of about 22,600 square miles (see map in the Nov., 1916, *Review*, Vol. 2, p. 363). Within this territory, according to the nature of the soil and topography, the prevalence of lakes and streams, etc., twenty natural geographical divisions are distinguishable. These various regions are described in more or less detail with reference to their geology and soils, topography and hydrography, vegetation, and economic features. As the work of a plant geographer, special interest attaches to the author's observations regarding the vegetation.

As the author remarks, native vegetation is probably the most sensitive indicator of geographical conditions that can be found. In the area under consideration the climate is essentially the same throughout, so that the diversity of vegetation is due largely to differences in soil and topography. Many attempts have been made by various investigators to correlate vegetation with soil, but few general principles, capable of world-wide application, have as yet been deduced. This fact, in Harper's opinion,

may be attributed to the general tendency to study vegetation qualitatively and taxonomically instead of quantitatively and morphologically; in other words, to the attempt on the part of investigators to connect environmental conditions with the presence or absence of certain species, regardless of their relative abundance and structural adaptations. A much better way, it is urged, of correlating vegetation with soil is to determine first the relative abundance of the different species in a given area, and then to group together all those that have some character in common, such as trees, vines, evergreens, or plants belonging to some given family, and see what proportion they make of the total.

Briefly stated, Harper's scheme for the quantitative analysis of vegetation is as follows. In traveling through a region repeated lists are made of all the wild plants observed, with notes as to their relative abundance. In this way the largest and most abundant plants are likely to be noted oftenest, which, in the author's opinion, is just what is wanted in a quantitative study. In analyzing these field notes, first of all a count is made of the number of times each species has been listed. The figures thus obtained are then modified with reference to the relative abundance of the various plants; figures for a plant noted as abundant are multiplied by 3, rarities are disregarded entirely, etc. Finally, allowance is made for differences in size or bulk; the average forest tree being taken as unity, figures for shrubs are divided by 100, for herbs by 1,000, etc. On a basis of the figures obtained in this way the bulk percentage of each plant or group of plants in the vegetation as a whole is calculated.

In the present report the vegetation is discussed quantitatively throughout. For each region a list is given of all except the rarer wild plants observed. These are first grouped according to growth form, and within these groups the species are listed as nearly as possible in the order of their quantitative abundance. Preceding the name of each species ordinarily is the percentage figure determined by the method above outlined. In summarizing his results, special stress is laid on the percentage of evergreens, *Ericaceae*, and *Leguminosae*. According to Harper, abundance of evergreens appears to be correlated with soils poor in potassium, abundance of *Ericaceae* with soils poor in calcium or potassium, and abundance of *Leguminosae* with relatively dry soils poor in nitrogen.

Harper's scheme for interpreting the facts of plant distribution in terms of geography is worthy of careful consideration at the hands of phytogeographers. There can be little doubt that failure to take into account the quantitative relations of the vegetation may lead to entirely erroneous conclusions. It is conceivable, for example, that two neighboring regions, quite distinct geographically, may have essentially identical floras but that the geographical dissimilarity may be clearly revealed by the different quantitative development of various elements in the vegetation. In the opinion of the reviewer, failure to take account of quantity is the chief weakness of Raunkiaer's application of "life-forms" to plant geography (see review in *Journal of Ecology*, Vol. 1, 1913, pp. 16-26). Harper's method also seems to have certain defects. Chief of these, from the standpoint of an ecologist, is the way in which herbs and shrubs are lumped together with trees and gauged by the same bulk criterion. This method of treatment may be satisfactory for making timber surveys, but for the purposes of a phytogeographical survey it leaves much to be desired. GEORGE E. NICHOLS.

SPAULDING, ARTHUR W. **The men of the mountains: The story of the Southern mountaineer and his kin of the Piedmont; with an account of some of the agencies of progress among them.** Introduction by P. P. Claxton, U. S. Commissioner of Education. iv and 320 pp.; map, ills. Southern Publishing Association, Nashville, 1915. $1.00. 9 x 6.

The introductory chapters, which give a broad survey of the Appalachian highlands south of the Potomac, appeal directly to geographers. In the sketch of early explorations, settlements, activities of religious sects, and military expeditions, the interaction of land and people is emphasized. Illiterate inhabitants of infertile mountain tops and cultured citizens of the Appalachian Valley are shown to be descended from the same pioneer stock. Contrasts between them are ascribed to geographical and economic causes.

The rest of the book, interesting to teacher and social worker, describes educational institutions within the region.

None of the material is new and there are trifling errors in physiographic nomenclature, but Mr. Spaulding successfully demonstrates by a geographical background the need of schools adapted to local conditions. MARY VERHOEFF.

ALVORD, C. W. **Virginia and the west: An interpretation.** *Mississippi Valley Hist. Rev.*, Vol. 3, 1916, No. 1, pp. 19-38.

BRANTLY, J. E. **A report on the limestones and marls of the coastal plain of Georgia.** x and 300 pp.; maps, diagrs., ills., index. *Geol. Survey of Georgia Bull. No. 21.* Atlanta, 1916. [With a 43-page section on the physiography, structure, and geology of the Georgia coastal plain (incorrectly referred to as "North Georgia" in the table of contents), illustrated by a geologic map, 1:1,000,000.]

CARTER, W. T., JR., AND J. P. D. HULL. **Soil survey of Montgomery County, Maryland.** 39 pp.; maps, ills. Bur. of Soils, U. S. Dept. of Agric., Washington, D. C., 1916.

—— **Florida: Standard guide.** 86 pp.; maps, ills. Foster & Reynolds Co., St. Augustine, 1916. 10 x 7.

FORGO, WILLIAM. **Southern Atlantic States and Washington, D. C.** (Forgo "See America" Guides, No. 4.) 96 pp.; diagrs., ills., index. Robert M. McBride & Co., New York, [1915]. 40 cents. 8 x 4½.

GRIMSLEY, G. P. **Jefferson, Berkeley, and Morgan Counties.** xxvi and 644 pp.; maps, diagrs., ills. *West Virginia Geol. Survey County Repts.*, Morgantown, 1916. [The geological report is preceded by a summary description of the history, physiography, and climate of these eastern Panhandle counties.]

—— **Key West, Florida, The new and greater, told in picture and story.** 44 pp.; map, ills. Key West Board of Trade, Publ. by J. A. Willis, Key West, [1915?]. 8½ x 5½.

KREBS, C. E., AND D. D. TEETS, JR. **Raleigh County and the western portions of Mercer and Summers Counties.** With: **Notes on the paleontology of Raleigh, Wyoming, McDowell and adjacent counties.** By W. A. Price. xx and 778 pp.; maps, diagrs., ills., index. *West Virginia Geol. Survey County Repts.* Wheeling, 1916. [Including as Part I short sections on the historical and industrial development and the physiography of the counties.]

LATIMER, W. J. **Soil survey of McDowell and Wyoming Counties, West Virginia.** 32 pp.; maps. Bur. of Soils, U. S. Dept. of Agric., Washington, D. C., 1916.

LATIMER, W. J. **Soil survey of Raleigh County, West Virginia.** 34 pp.; maps. Bur. of Soils, U. S. Dept. of Agric., Washington, D. C., 1916.

MAIGNE, C. M. **How the shrimp industry saved Fernandina.** Ills. *Scientific American*, July 8, Vol. 115, 1916, p. 35. [Fernandina is a small city of Florida whose trade in lumber and naval stores was curtailed on the outbreak of war.]

REHN, J. A. G., AND MORGAN HEBARD. **Studies in the Dermaptera and Orthoptera of the Coastal Plain and Piedmont region of the southeastern United States.** Maps, diagrs., ills. *Proc. Acad. Nat. Sci. of Philadelphia*, Vol. 68, 1916, Part 2, pp. 87-314. [The physiographic divisions found correlated with the distribution of species in the South Atlantic States are High Appalachian summits; Lower summits and Valleys of the Appalachian Uplift; Piedmont; Coastal Plain embracing Upper and Lower Divisions; Maritime and Estuarine region.]

ROBINSON, M. P. **Virginia counties: Those resulting from Virginia legislation.** 283 pp.; maps, index, bibliogr. *Bull. Virginia State Library*, Vol. 9, 1916. Nos. 1-3. Richmond. [Including a bibliography and set of maps showing progress of settlement in Virginia.]

SCHOFF, W. H. **Chesapeake Bay and tributaries.** Ills. *Commerc. America*, Vol. 12, 1916, No. 12, pp. 15, 17, 19, and 21.

SELLARD, E. S. **Mineral industries of Florida during 1915.** *Florida State Geol. Survey, Eighth Ann. Rept.*, pp. 19-37. Tallahassee, 1916.

SWEM, E. G. **A bibliography of Virginia, Part 1: Containing the titles of books in the Virginia State Library which relate to Virginia and Virginians, the titles of those books written by Virginians, and of those printed in Virginia.** Index. *Bull. Virginia State Library*, Vol. 8, 1915, No. 24, pp. 35-767. Richmond, 1916.

WILLEY, D. A. **Reclaiming the Everglades of Florida.** Ills. *Scientific American*, Vol. 115, 1916, pp. 258-259.

—— ***District of Columbia, Map of the permanent system of highways.*** 1:12,000. Engineer Commissioner, Washington, D. C., 1914.

—— ***Florida, Map of the Everglades drainage district of.*** 1:380,000. Chief Drainage Engineer, Tallahassee, 1915.

—— ***Florida, New sectional map of.*** 1:633,600. Florida Dept. of Agric., Tallahassee, 1916.

—— ***Florida, State of.*** 1:500,000. U. S. Geological Survey, Washington, 1916.

—— ***Henlopen, Cape, and the Delaware Breakwater.*** *U. S. Coast and Geodetic Survey Chart No. 379.* Washington, D. C., August, 1916.

HERMANN, AUGUSTIN. ***Virginia and Maryland, as it is planted and inhabited this present year 1670. Surveyed and exactly drawne by the only labor and endeavour of Augustin Hermann.*** [Photo-facsimile.] 1 in. to 7.5 mi. (1:475,000). [Also book edition with text, W. H. Lowdermilk & Co., Washington, D. C., 1911.]

—— ***Maryland and Delaware, The Rand McNally new commercial atlas map of*** [with text and inset of Baltimore and environs]. 1:6,000,000. Rand McNally Co., Chicago, 1916.

—— ***Portsmouth Island, North Carolina, to Beaufort, including Cape Lookout Shoals.*** 1:80,000. *U. S. Coast and Geodetic Survey Chart No. 1233.* Washington, D. C., 1916.

—— ***Talking Rock, Georgia, sheet.*** [*Topographic map of the United States.*] 1:62,500. U. S. Geological Survey, Washington, D. C., 1916.

—— ***Tybee Roads. Savannah River and Wassaw Sound, Georgia.*** 1:40,000. *U. S. Coast and Geodetic Survey Chart No. 440.* Washington, D. C., August, 1916.

—— ***Virginia, The Rand McNally new commercial atlas map of*** [with text]. 1:887,040. Rand McNally Co., Chicago, 1916.

North-Central States

SARDESON, F. W. **Geologic atlas of the United States: Minneapolis-St. Paul folio, Minnesota.** 14 pp.; maps, ills. *U. S. Geol. Survey Geol. Folio No. 201.* Washington, D. C., 1916.

This folio will be of great educational value locally to the inhabitants of the area, numbering some 500,000, and, in a more general way, to a wider circle. Two pages are given to introduction, with an index map showing the location of the four fifteen-minute quadrangles which are embraced in the folio, another map showing the geographic provinces, and a third showing the bed rock formations of Minnesota and the adjacent region. These, with the text, give a proper setting for the detailed descriptions which follow.

Most of the area is deeply covered with glacial drift. The exposed rock formations are of Ordovician age. Three drift sheets are discriminated: Kansan, Early Wisconsin, and Late Wisconsin. Later than these are the terrace gravels, dune sands, and recent deposits. The curvature of the ice motion in the western lobe of the Late Wisconsin glacier is such that over the area shown by the folio the motion was from the southwest. An interesting discussion is given of the origin and duration of St. Anthony Falls. Following Winchell's determinations it is concluded that the falls have been in existence more than 12,000 years. Building materials and water resources are the important economic assets of a geologic nature.

The maps and illustrations are excellent. It was wisely decided as in other recent folios to publish all maps on the 1:62,500 scale instead of condensing the four quadrangles into one sheet on half this scale. The scale of 1:62,500 enables the maps to be used readily on the ground and by those but little experienced in reading and interpreting maps. They show great areas of dune sand and marsh land to the north of the twin cities, gently hilly country interspersed with lakes on the south. The pages of illustrations serve to make the folio more attractive and the descriptions more real. It would seem that large use should be made of this publication in the high school departments of the public school system of Minnesota. JOSEPH BARRELL.

ALWAY, F. J. **Soil maps of Minnesota.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 205-206.

CADY, LE ROY. **Fruit growing in Minnesota.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 211-214.

CHEYNEY, E. G. **The development of the lumber industry in Minnesota.** Map. *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 189-195.

COFFEY, G. N., JOHN WOODARD, AND J. M. SNYDER. **Soil survey of Trumbull County, Ohio.** 53 pp.; maps. Bur. of Soils, U. S. Dept. of Agric., Washington, D. C., 1916.

COLBY, C. C. **The driftless area of Minnesota, a geographic unit.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 165-167.

DAVIS, L. V., AND M. E. SAR. **Soil survey of Lee County, Iowa.** 36 pp.; maps, ills. Bur. of Soils, U. S. Dept. of Agric., Washington, D. C., 1916.

DURAND, E. D. **Manufactures in Minnesota.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 218-222.

DUSTIN, FRED. **Saginaw County as a center of aboriginal population.** *Michigan Hist. Collections*, Vol. 39, pp. 251-260. Lansing, 1915.

EMMONS, W. H. **The iron ores of Minnesota.** Map. *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 177-182.

EVERLY, L. L. **Minnesota cities: St. Paul.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 227-229.

GROUT, F. F. **The clays of Minnesota.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 185-187.

—— **Hot Springs of Arkansas, General information regarding the.** 10 pp.; map. Dept. of the Interior, Washington, D. C., 1916.

HUFF, C. E. **Minnesota cities: Minneapolis.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 223-226.

JENKS, W. L. **The Michael Shoemaker collection of maps.** *Michigan Hist. Collections*, Vol. 39, pp. 297-300. Lansing, 1915. ["Early maps relating to the Great Lakes region."]

JOHNSTON, A. W. **The physical geography of Minnesota.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 161-165.

LEONARD, A. G. **The pre-Wisconsin drift of North Dakota.** Map, ills. *Journ. of Geol.*, Vol. 24, 1916, No. 6, pp. 521-532.

MILLER, G. J. **Agriculture in Minnesota.** Diagrs. *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 196-201.

—— **Minnesota number of the *Journal of Geography*.** Maps, diagrs. Vol. 14, 1916, No. 6 (pp. 161-244). [The entire number is devoted to a series of papers discussing various features of Minnesota geography, which are individually listed in this section. See the item on Geographic Controls in the Development of Minnesota in the June, 1916, *Review* (Vol. 1, p. 456).]

MOONEY, C. N., H. G. LEWIS, A. F. HEAD, AND C. W. SHIFFLER. **Soil survey of Portage County, Ohio.** 44 pp.; maps. Bur. of Soils, U. S. Dept. of Agric., Washington, D. C., 1916.

POSEY, C. J. **Geographic influences in the exploration and early development of Minnesota.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 214-217.

SCARBOROUGH, R. J. **The lesser cities of Minnesota.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 233-236.

SMITH, S. L. **Pre-historic and modern copper mines of Lake Superior.** *Michigan Hist. Collections*, Vol. 39, pp. 137-151. Lansing, 1915.

SOPER, E. K. **Peat in Minnesota.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 182-185.

STEERE, J. H. **The upper peninsula: A sketch.** *Michigan Hist. Collections*, Vol. 39, pp. 235-247. Lansing, 1915.

TOWNSEND, C. McD. **The currents of Lake Michigan and their influence on the climate of the neighboring states.** Map. *Journ. Western Soc. of Engineers*, Vol. 21, 1916, No. 4, pp. 293-309. [The author was a member of the board appointed to investigate lake problems relating to the proposed waterway from Lockport, Ill., to the mouth of the Illinois River. In this capacity he instituted a series of observations on the directions of the wind and the currents of the lake and on the temperatures of air and water. His conclusions in respect of the lake currents are contrary to those published by the Weather Bureau as a result of their bottle-drift experiments, carried on during the summers of 1892-94. The Weather Bureau's chart indicates a main current flowing southward along the west shore to swing northward along the east shore. Colonel Townsend's conclusion is that the currents vary with the wind and have no permanently defined direction.]

TRYON, F. G. **The water resources of Minnesota.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 174-177.

VANATTA, E. S., AND E. W. KNOBEL. **Soil survey of Harrison County, Missouri.** 36 pp.; maps. Bur. of Soils, U. S. Dept. of Agric., Washington, D. C., 1916.

VAN CLEEF, EUGENE. **The climate of Minnesota.** Maps. *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 168-174.

VAN CLEEF, EUGENE. **Minnesota cities: Duluth and the Range towns.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 230-233.

VISHER, S. S. **Notes on the geography of the Red River Valley.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 6, pp. 202-205.

EUROPE

RUSSIA

CHILD, R. W. **Potential Russia.** 221 pp. E. P. Dutton and Company, New York, 1916. $1.50. 7½ x 5.

Part of the material used in this work has appeared in the magazines, including *Collier's*, which commissioned Mr. Child to go to Russia. The title expresses its underlying thought. Russia is studied with a view to determine, not what she has actually accomplished, but her possibilities for the future. Without predicting the revolution, in fact denying its probability, the author speaks of the promise of a new social era in Russia, the beginning of a development of a vast human, material, and spiritual resource. To depict the unit that makes up the Russian army, the story of an individual is traced from his infancy in a half-thatched peasant home, through his youth as a clean-living sturdy farmer who learned to read as an accomplishment to please his sweetheart, till the war came. Soon after, he leaves his home for the first time, drawn into the army. In Petrograd he receives his training and in his new uniform he makes a magnificent-looking soldier. With the order to the front he first sees war. The ammunition the men should have had was lying in the snow thirty miles south of Archangel, but, knowing nothing of that, Maxim and his comrades charge the German machine guns in an ecstasy of devotion, then pitch face forward into a swamp. The muzhik, one of millions, has given his all for Russia.

A terrible story is told of the flight of the refugees from the western front, their number estimated at between eight and fourteen millions. Thousands of children were lost or perished of hunger and cold on the roads. Without knowing where to go the refugees instinctively headed towards the railroads and the cities. Moscow and Petrograd received each a million, but the greatest number were lost struggling over the plain.

In speaking of Russian reverses and internal troubles the author calls the country a great resilient lump. "It may not be difficult to stick a thumb into Russia, but it is tiresome trying to keep it there." The fact is often reiterated that Russia is a land of 125,000,000 peasants, of whom the larger part cannot read or write. To know the true Russian one must go to the villages. The impression that the bureaucracy has constantly opposed elementary education is corrected. Lack of money and poor management, combined with the wide scattering of the population, have made schools for all a difficult problem, but the local self-governments have done much.

Russia's experiment in national prohibition is given the highest praise. The current price of a pint of vodka—26 rubles—answers the question whether the decree has been avoided. The measure has been reflected not only in the productive efficiency of the people, but also in their savings, which from an average monthly deposit of 3,000,000 rubles in 1913 rose to 50,000,000 in 1916. The revenue formerly derived from the government's monopoly can be taken back in taxes and leave the people better off.

Russia, once the cold storage of Europe, has become the biggest possibility in the world. The people have learned to cease dreaming and to act together for their own advantage. American business men are advised not to neglect this tremendous market and field for investment.

R. S. HARVEY.

LETHBRIDGE, MARJORIE, AND ALAN LETHBRIDGE. **The soul of the Russian.** x and 238 pp. John Lane, London; John Lane Company, New York, 1916. $1.25. 8 x 5.

This is a collection of short sketches dealing with the observations and reflections of two English travelers in Russia. Many of the sketches are reprints of papers that appeared in the *Outlook*, the *Standard*, and the *Evening Standard*. Although the book is not lacking in interest, such slight and desultory studies scarcely deserve their high-sounding title. The topics range widely. There is an account of the Pan-Slav apostle, Krijanich, born in 1617, who warned the Russians in the most stringent terms against the domination of the Germans. The transference of the capital from Moscow to Petrograd is declared by the authors to be a monument to the egotism of Peter the Great. Partly owing to its geographical unsuitability and partly to its nearness to Germany, Petrograd has become a denationalized capital, in no sense a Russian city

such as Kieff or Moscow. Two of the most interesting chapters in the book are those on "The Ikon" and "Siberia and the War." The ikon is found not only in every room of every house but also in all public places, a constant reminder to the Orthodox of the presence of his Creator. The Trans-Siberian railway and the war with Japan are described as the forces which caused the awakening of Siberia. The latest impulse to Siberian development is of a curious origin. Thousands of prisoners from Galicia and Hungary were sent there early in the war. Many of these men had learned trades, they were hardy, had some education, and, in short, became ideal colonists of exactly the type needed for the development of industries in Siberia. Most of them have voluntarily entered employment and it is expected will remain in Siberia after the war.

R. S. HARVEY.

BALKAN STATES, INCLUDING RUMANIA

DWIGHT, H. G. **Saloniki.** Ills. *Natl. Geogr. Mag.*, Vol. 30, 1916, No. 3, pp. 203-232.

HERBERT, MURIEL. **Serbia and the Serbians.** 114 pp.; map, ills. Waifs and Strays Society, London, 1916. 1s. 7 x 4½.

KEHL, J. E. **Saloniki.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 7a, pp. 20-28. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

LA GORCE, J. O. **Roumania and its Rubicon.** Ills. *Natl. Geogr. Mag.*, Vol. 30, 1916, No. 3, pp. 185-202.

MARTONNE, EMM. DE. **La Roumanie et son rôle dans l'Europe orientale.** Map, bibliogr. *La Géographie*, Vol. 30, 1914-15, No. 4, pp. 241-250. Paris.

MAULL, OTTO. **Vorläufiger Bericht über eine Studienreise durch den Peloponnes und Mittelgriechenland.** *Mitt. der Geogr. Gesell. in München*, Vol. 9, 1914, No. 3, pp. 488-494.

PETROVITCH, W. M. **Serbia, her people, history, and aspirations.** 280 pp.; ills. F. A. Stokes Co., New York, [1915]. $1.50. 7½ x 5.

TABET, E. G. **The future of Constantinople and the Caliphate.** *The Nation*, No. 2673, Vol. 103, 1916, Sept. 21, pp. 276-278.

WALDO, F. L. **A sea-trail from Serbia (September, 1915).** *Bull. Geogr. Soc. of Philadelphia*, Vol. 14, 1916, No. 2, pp. 60-67.

WEDDELL, A. W. **Athens.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 7a, pp. 1-9. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

WEDDELL, A. W. **Greece.** 6 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 7b. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— ***Balkan peninsula, The theatre of war in.*** 1:1,140,000. Edw. Stanford, London, 1916.

COLOCCI, A. ***La futura Balcania secondo le pretese degli Imperi Centrali*** [with text]. 1:3,000,000. Istituto Geografico de Agostini, Novara, 1916.

EVANS, SIR ARTHUR. ***Diagrammatic map of Slav territories east of the Adriatic.*** 1:2,000,000. Accompanies "The Adriatic Slavs and the Overland Route to Constantinople" by Sir Arthur Evans, *Geogr. Journ.*, Vol. 47, 1916, No. 4.

—— ***Gallipoli, map of the Anzac position, to illustrate Sir Ian Hamilton's despatch of December 11th, 1915.*** 1:20,000. Geographical Section, General Staff, War Office, London, 1916.

GROSS, ALEXANDER. ***The Daily Telegraph war map No. 10.*** [Map described in advertisement as "Balkans and Eastern Europe."] Inset: Northern Serbia. 1 in. to 32 mi. (1:2,027,520). "Geographia," Ltd., London, 1916.

AFRICA

SAHARA, INCLUDING EGYPT

—— **Almanac for the year 1916.** viii and 248 pp.; index. [Egyptian] Government Press, Cairo, 1915. 5 P. T. 7 x 5.

ANDREA, R. N. **La produzione e l'industria dello zucchero in Egitto.** 8 pp. *Direz. Gen. degli Affari Comm.* [*Fasc.*] *No. 8*, Minist. degli Affari Esteri, Rome, 1916.

BANSE, EWALD. **Die libysche Wüstenplatte und die Marmarika.** Map, ills. *Petermanns Mitt.*, Vol. 62, 1916, Sept., pp. 333-337.

BEAUGÉ, CHARLES. **Notes sur l'Égypte: Voyage dans le désert de Basse-Thébaïde aux couvents de Saint-Antoine et de Saint-Paul.** *Bull. du Comité des Trav. Hist. et Sci.: Sect. de Géogr.*, Vol. 29, 1914, pp. 136-154. Minist. de l'Instr. Publ. et des Beaux-Arts, Paris.

BLACKMAN, A. M. **The rock tombs of Meir: The tomb-chapel of Senbi's son Ukh-Hotp** (B. No. 2). 46 pp.; diagrs., ills., index. *Archæol. Surv. of Egypt, Memoir 23.* London, 1915.

CATELLANI, ENRICO. **L'Egitto dal dominio ottomano al protettorato britannico.** *Riv. Colon.*, Vol. 11, 1916, No. 1, pp. 1-16; No. 2, pp. 73-88.

CLARKE, SOMERS. **Ancient Egyptian frontier fortresses.** Map, diagrs. *Journ. of Egyptian Archæology*, Vol. 3, 1916, Part 3, pp. 155-179. [Fortresses on the barrier of the Second Cataract.]

DORSEY, W. R. **Libya.** 8 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 74a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

—— **Égypte, Bulletin mensuel du commerce extérieur de l', avec appendice sur le Soudan.** Vol. 30, Nos. 3-11 (March-Nov., 1916). 35 pp. each. Direction Générale des Douanes Egyptiennes, Alexandria.

—— **Égypte, Résumé comparatif du commerce extérieur de l', années 1884-1915.** lxii and 216 pp.; diagr., index. Direction générale des Douanes Egyptiennes, Alexandria, March, 1916.

GARRELS, ARTHUR. **Egypt.** 8 pp. *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 68a. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

HURST, H. E. **Note on high temperatures experienced in Egypt in June, 1915.** Map, diagr. *Quart. Journ. Roy. Meteorol. Soc.*, No. 177, Vol. 42, 1916, pp. 55-56.

KING, W. J. H. **The nature and formation of sand ripples and dunes.** Diagr., ills. *Geogr. Journ.*, Vol. 47, 1916, No. 3, pp. 189-207.

LARGEAU, GÉNÉRAL. **Le territoire militaire du Tchad en 1913.** *Renseign. Colon.*, 1915, No. 5, pp. 125-141.

LÖFLER, —. **La pacification du Tibesti (1913-1914): Rapport d'ensemble du chef de la colonne.** Map. *Renseign. Colon.* (*Suppl. à l'Afrique Franç.*), 1916, No. 7, pp. 173-199.

—— **Public Works during 1914-1915, including January, February, and March, 1914. Report of the Under Secretary of State of the Ministry of.** 126 pp.; maps, diagrs., ills. Ministry of Public Works, Cairo, 1916. [Devoted chiefly to irrigation.]

ROLOFF, GUSTAV. **Napoleons ägyptische Expedition im Jahre 1789 als Kampfmittel gegen England.** 22 pp. *Meereskunde: Sammlung volkstümlicher Vorträge*, Vol. 8, 1915, No. 12. Berlin.

SMYTH, W. H. **Le coste della Libia e le vie da Tripoli per l'interno dell' Africa.** *Archivio Bibliogr. Colon.*, Vol. 1, 1915, No. 2-3-4, pp. 157-163. Florence.

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